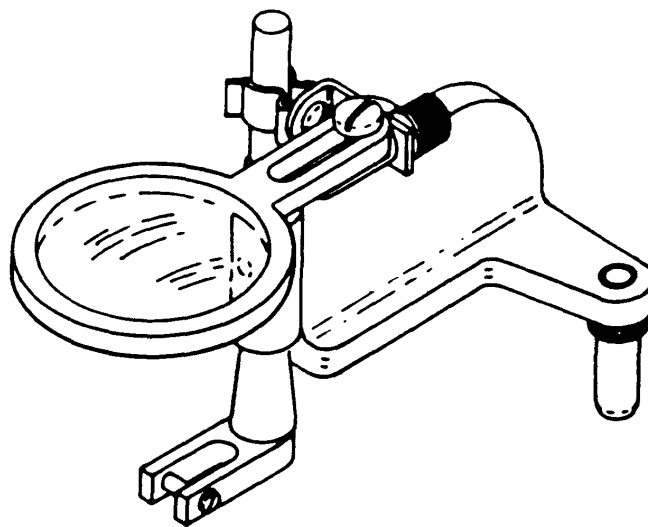


**US ARMY ENGINEER SCHOOL
COLOR SEPARATION
Cartography VII**



**THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM**

**US ARMY CARTOGRAPHER
MOS 81C BASIC CARTOGRAPHY COURSE**

**COLOR SEPARATION
Cartography VII**

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SUBCOURSE NO. EN5307

Eight Credit Hours

GENERAL

The Color Separation subcourse, part of the Cartographic Specialist MOS 81C Basic Cartography Course, is designed to teach the skills necessary to color separate maps. There are five lessons pertaining to the color separation process in multicolor printing. Each lesson corresponds to a terminal objective.

Lesson 1

INTRODUCTION TO CARTOGRAPHIC INSTRUMENTS AND MATERIALS

OBJECTIVE: Identify the various cartographic instruments and materials according to their characteristics, design, and practical applications. Describe the procedures used to perform preventive and operational maintenance on cartographic instruments and equipment. Identify publications and manuals covering color separation.

TASKS: Identify cartographic instruments and materials. Perform preventive and operational maintenance on cartographic instruments and equipment.

CONDITIONS: You will be given subcourse booklet EN5307, an Army Correspondence Course Program (ACCP) Examination Response Sheet, and a Number 2 pencil. You will complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS: You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

Lesson 2

PREPARATION FOR SCRIBING

OBJECTIVE: Describe the basic methods of scribing including sharpening, leveling, and troubleshooting equipment. Describe good scribing practices and techniques used for maximum scribing efficiency.

TASKS: Identify procedures for leveling the graver and sharpening a needle point or steel blade edge. Demonstrate knowledge of good scribing practices and techniques.

CONDITIONS: You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. You will complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS: You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

Lesson 3

PREPARATION OF THE TYPE LIST AND TYPE OVERLAY

OBJECTIVE: Describe the basic principles of ordering type using DA Form 2594-R (Type List Order) and preparing a type overlay using stick-up type.

TASKS: 051-257-1304, Prepare a type list order.
051-257-1312, Produce interior type flats.
051-257-1313, Produce marginal data flats.

CONDITIONS: You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. You will complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS: You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

Lesson 4

PROCEDURES FOR COLOR SEPARATION

OBJECTIVE: Describe the basic procedures of the color-separation process using the various methods of color separation. Identify the methods of color separation and the five phases of the color-separation process.

TASKS: 051-257-1307, Scribe cultural features.
051-257-1308, Scribe miscellaneous cultural features.
051-257-1309, Scribe hydrographic features.
051-257-1310, Scribe hypsographic features.
051-257-1311, Produce open window flats.
051-257-2025, Edit color separation projects.

CONDITIONS: You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. You will complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS: You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

Lesson 5

SPECIFICATIONS FOR COLOR SEPARATION

OBJECTIVE: Identify the correct chapter, section, or appendix in the Defense Mapping Agency Hydrographic/Topographic Center Technical Manual, Specification 1 (DMAHTC TM S-1) which pertains to the color separated material being prepared.

CONDITIONS: You will be given information on how to use and locate information in the DMAHTC TM S-1, subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. You will work at your own pace in your own environment with no supervision.

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***** IMPORTANT NOTICE *****

THE PASSING SCORE FOR ALL ACCP MATERIAL IS NOW 70%.

PLEASE DISREGARD ALL REFERENCES TO THE 75% REQUIREMENT.

INTRODUCTION

Before a multicolored map can be printed, it must go through a process known as color separation. Each color appearing on the map is depicted separately with its proper symbolization according to appropriate specifications.

There are various methods used for color separation: film and filtering, masking, opaquing, pen-and-ink drafting, and plastic scribing. Each method has advantages and disadvantages depending on the situation, time limits, and other production variables.

Plastic scribing (negative engraving) has replaced pen-and-ink drafting and offers several advantages. It is a faster process. Training inexperienced workers is easier. Presharpened points assure uniform line weights and excellent detail. Scribing gives more accurate results in less time than pen-and-ink drafting.

**LESSON 1
INTRODUCTION TO CARTOGRAPHIC
INSTRUMENTS AND MATERIALS**

OBJECTIVE

Identify the various cartographic instruments and materials according to their characteristics, design, and practical applications. Describe the procedures used to perform preventive and operational maintenance on cartographic instruments and equipment. Identify publications and manuals covering color separation.

TASKS

Identify cartographic instruments and materials. Perform preventive and operational maintenance on cartographic instruments and equipment.

CONDITIONS

You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. Complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS

You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

CREDIT HOURS

1

REFERENCES

TM 5-240, Compilation and Color Separation of Topographic Maps

Lesson 1/Learning Event 1

Learning Event 1: MATERIALS

Scribecoats

Scribecoats used by military units are commercially produced and available through supply channels. Important features of scribecoats are as follows.

Base. The plastic base material must be transparent and stable to permit sharp reproduction of detail without any distortion to scale and registration (correct alignment). It must be light and reasonably flexible for easy handling, yet tough and durable to provide for future revision work or printing.

Coating. The coating is usually orange or rust colored and has a dull, silken finish. The coating is the medium upon which the map manuscript image is produced. Although it is translucent (allows light to pass through it), it is "actinically opaque." That is, it prevents the passage of certain light rays to which the press plate is sensitive. It must be tough, yet flexible, and soft enough to permit easy scribing. It must adhere tightly to the base material so that sharp angles and close parallel lines may be cleanly scribed.

Peelcoats

Peelcoats consist of the same plastic base material used for scribecoats, but with a dyed albumin or gelatin coating that can be cut or etched and then stripped off or peeled up to form an open-window negative. The coating may be sensitized to receive a photographic image of the map's large-area features. The coating is then manually cut with an etching knife and peeled away.

Overlay Material

The overlay material consists of a transparent plastic base used for placement of names, labels, prepared patterns, and prepared symbols which appear in typed or positive form. Using the same kind and weight of plastic avoids differential changes in size which might affect registration. A separate transparent overlay is prepared for each color in which type or prepared symbols are to be printed. These overlays must be exactly registered to the scribed negative or map base that they supplement.

Opaquing Pencil and Opaquing Fluid

An opaquing pencil is a papercased, spiral-wound, china-marking type. Opaquing fluid is a lacquer-based orange touch-up fluid that dries rapidly. Both opaquing materials are used to make deletions and corrections to scribed detail. The opaquing pencil is recommended for correcting minor errors in the scribed line up to 0.010 inch (0.25 millimeter) in weight. The opaquing fluid is used when moderate corrections are required or when line weights exceed 0.010 inch (0.25 millimeter).

Learning Event 2: DRAFTING EQUIPMENT

Scribing on scribecoats is performed with the instruments and accessories furnished in the drafting equipment set. This set has all the instruments necessary for one cartographer to perform all scribing operations.

Gravers

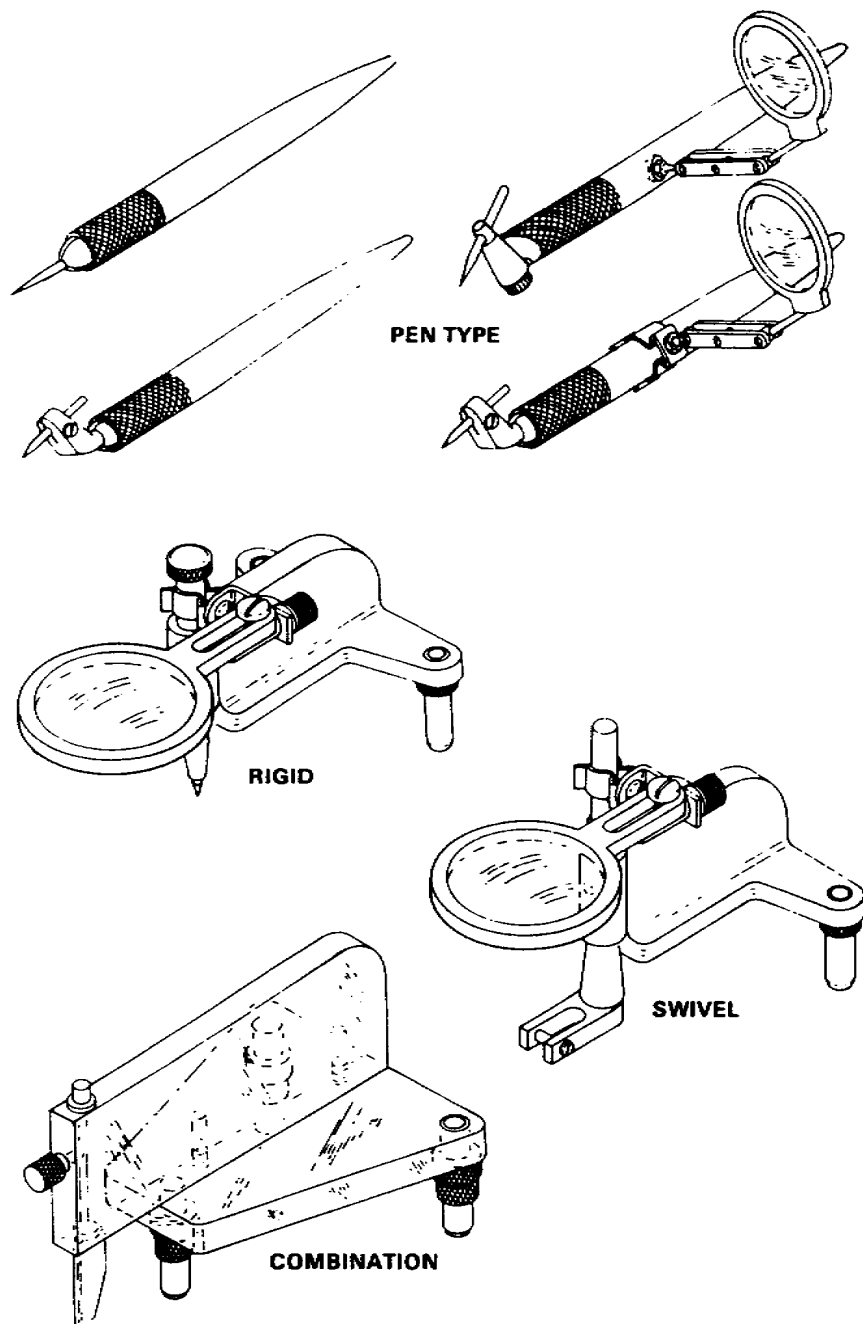
The various gravers (Figure 1, page 4) hold scribing needles or blades at the preset cutting angle and maintain constant cutting width. Each graver has a comfortable handgrip with a chuck or setscrew device to hold the scribing point. There are several types of gravers available to military units. Some have presharpended points with jeweled or carborundum tips. Others use steel phonograph needles, which must be sharpened to the size and shape desired to scribe a particular line weight or symbol.

Pen-type graver. A pen-type graver is a simple pin vise with an angled head. A phonograph needle or tip is secured in the head by a setscrew or drawbolt. The tip is nearly perpendicular to the work surface when the graver is held in a normal writing position. Unlike other gravers, the pen-type graver does not hold the point at a constant angle to the scribing surface. The pen-type graver can be used for scribing tapered streams, tight areas of relief, freehand symbols, and for the touch-up and correction of existing line work.

Rigid graver. A rigid graver is a tripod-like instrument consisting of a housing supported by two legs and a scribing point. The instrument is equipped with a magnifying glass which may be adjusted to bring the image into focus. Steel phonograph needles are recommended for use in the rigid graver. An adjustable chuck permits the use of several sizes of needles. Steel ball bearings mounted in the bottom of each supporting leg allow the instrument to move and help to prevent damage to the scribing surface. The rigid graver is used for engraving single line features up to 0.01 inch in weight. It is used freehand or with straightedges, guides, or templates.

Swivel graver. The swivel graver has an adjustable magnifying glass and is used for scribing single and multiple line linear features such as roads, railroads, and boundaries. The special design enables the scribing edge to transverse freely or rotate 360 degrees. Cutting blades that are machine tooled to predetermined specifications are used in the swivel graver instead of phonograph needles. The blades are mounted in slots in an offset arm attached to a vertical swivel shaft and are held firmly in place by a tension screw. Because of the swiveling action, the shaft must always be perpendicular to the scribing surface. This position is maintained by adjustable legs, adjustable shaft, or by a leveling mechanism at the junction of the arm and shaft. A knurled setscrew keeps the arm from turning while lines are being scribed along a straightedge.

FIGURE 1. TYPICAL LINE GRAVERS

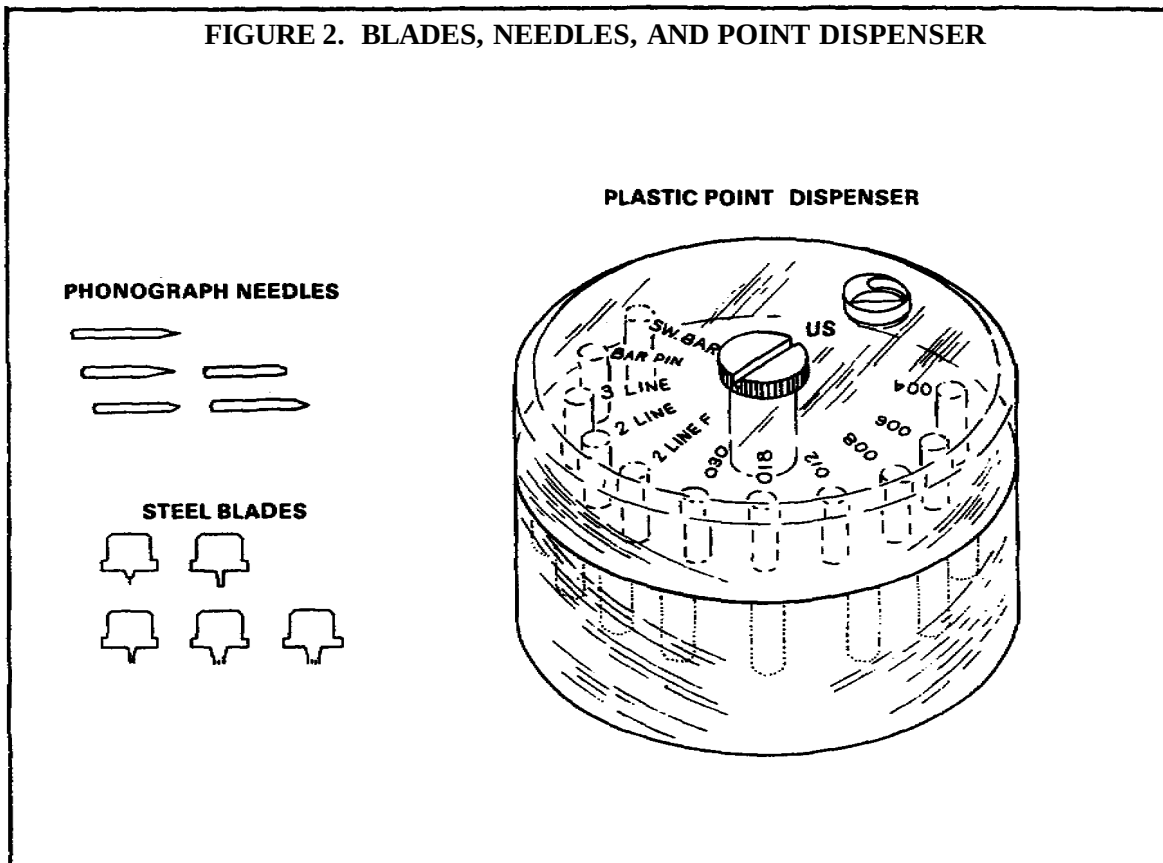


Combination graver. A combination graver performs the functions of both rigid and swivel gravers. It is similar in basic design to the swivel graver and is converted from swivel action to rigid by tightening a setscrew on the vertical shaft. A third leg, provided to aid in leveling the instrument, is removed for the scribing operation.

Scribing Needles and Blades

Phonograph needles. Phonograph needles (Figure 2) are used in pen-type gravers, rigid gravers, and the combination graver when set up for rigid operations. The weight of lines drawn with new needles ranges from 0.002 inch to 0.003 inch. Only a few turns on the sharpening stone will change the line weight by 0.001 of an inch. The cutting ability of the needle's point is checked by scribing in all directions while maintaining a constant line weight. Both sides of the cut line should be smooth.

NOTE: The abrasive action of the scribecoat emulsion wears the needles. Therefore, check the line weight frequently with the optical microscope.



Steel blades. Steel blades (Figure 2) are used with the swivel graver and the combination graver when they are set up for swivel operations. New blades come presharpener; however, microscopic examination of scribed lines may reveal these blades need to be refined. Spade and multiple line blades are two types of steel blades used in color separation.

Spade blades. Spade blades have single points of variable widths for the scribing of single-line features.

Multiple line blades. Multiple line blades have from two to four points of variable widths and spacing for the scribing of multiple-line features.

Lesson 1 /Learning Event 2

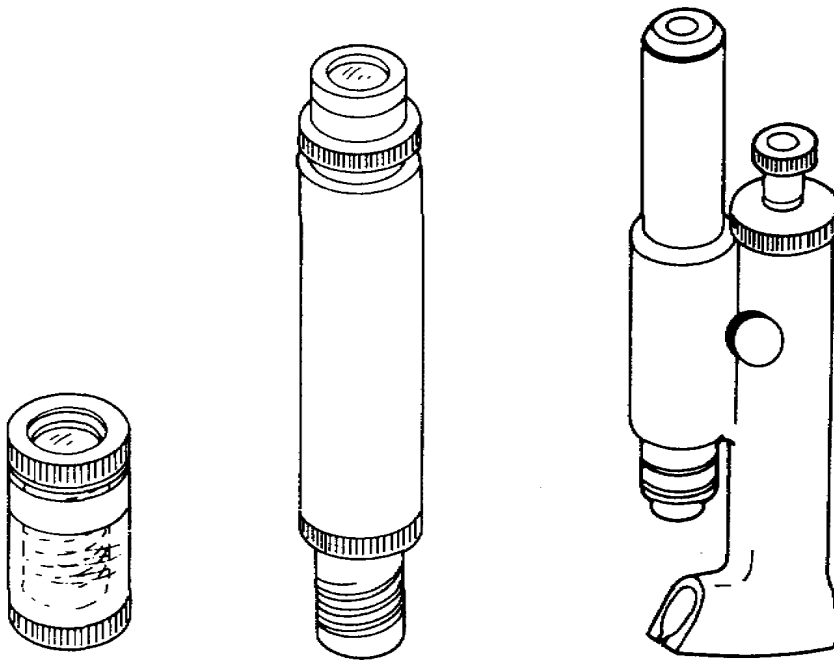
Plastic Point Dispenser

The plastic point dispenser (Figure 2, page 5) makes quick selection of the desired point or tool attachment easier, as the top can be rotated to the proper hole and the dispenser inverted. The dispenser has 12 scribing points, the swivel chuck for the combination scribing instrument, and the detachable pin or bar pin for the swivel chuck. The scribing points consist of a synthetic sapphire or synthetic ruby tip fixed in a stainless steel shaft and ground to exact dimensions.

Optical Microscopes

These optical microscopes (Figure 3) are used to magnify line work for a visual verification of line weight and to plot points accurately to within .010 inch (.25 millimeter). The optical lens of the microscopes contains English and metric scales for the measurement of line weights. The English scale is graduated in increments of 0.005 inches, and the metric scale is graduated in increments of .20 millimeters. Look through the center of the eye lens in a direction perpendicular to the microscope's base plane to minimize distortion.

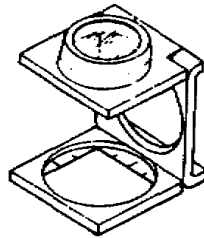
FIGURE 3. OPTICAL MICROSCOPES



Monocular Magnifier

The monocular magnifier (Figure 4) is used to magnify details in a congested area and to inspect the scribed line work, thus ensuring clean, smooth scribed lines.

FIGURE 4. MONOCULAR MAGNIFIER

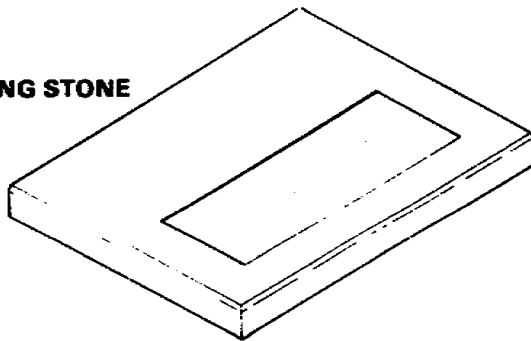


Sharpening Equipment

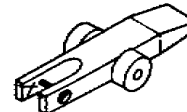
Phonograph needles and steel blades used in some gravers must be precisely shaped and sharpened in order to scribe uniform lines. Round points on phonograph needles and beveled cutting edges on the steel blades must be carefully ground to specified line weights with the most effective cutting angles. The sharpening stone and the jig (Figure 5) are the most commonly used sharpening equipment in military units.

FIGURE 5. SHARPENING STONE AND JIG

SHARPENING STONE



JIG



Sharpening stone. The sharpening stone (Figure 5) is a very fine-grained, high-quality stone for the sharpening of phonograph needles and steel blades. Two thin slabs of stone are usually housed in a plastic base. The stones are leveled to the base housing and held in place by four leveling allen screws, the base bottom, and two retention screws along the base edge. The stone slabs must be tangent with the base surface in order to retain and complement the jig's preset angle for sharpening the steel blades.

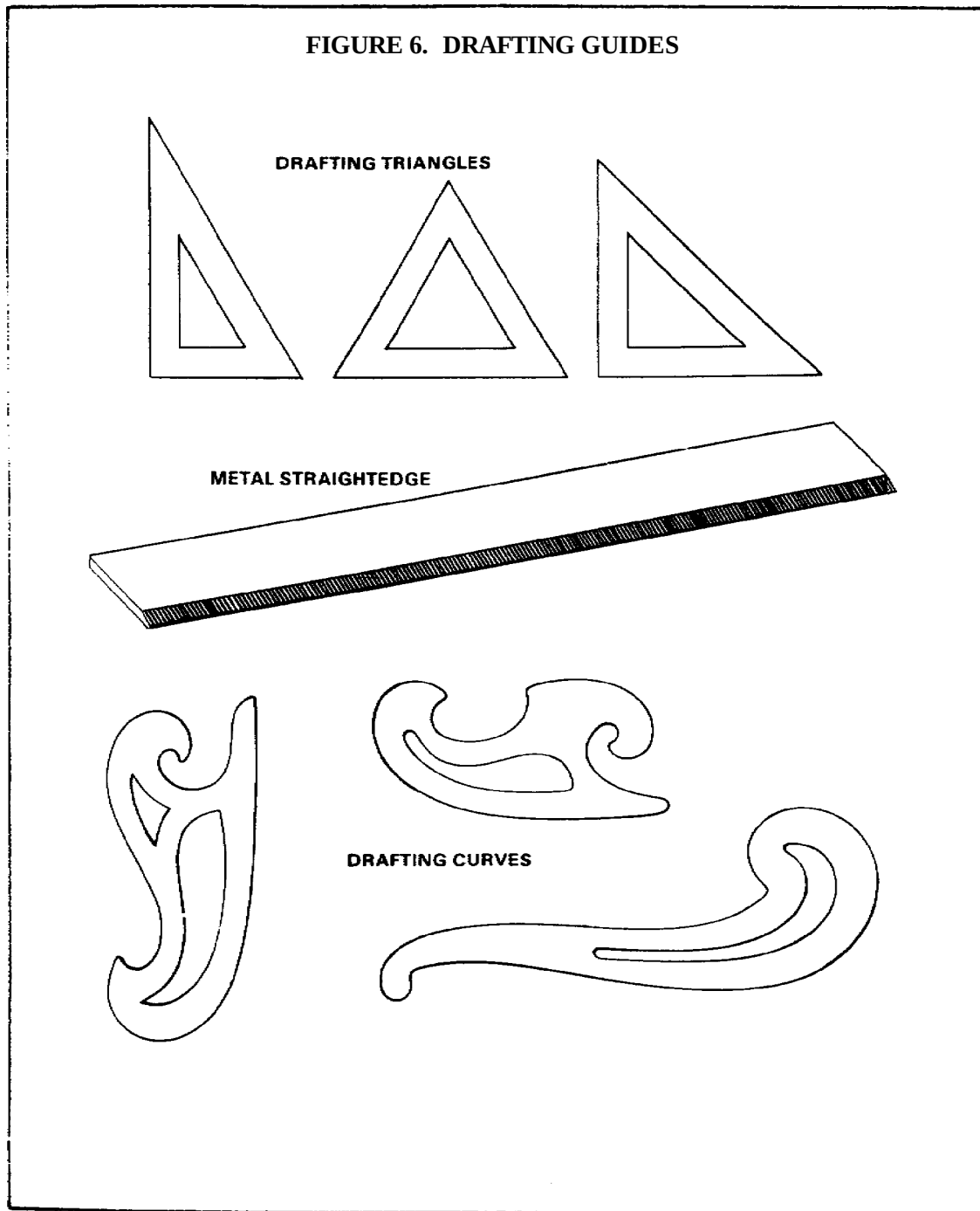
Jig. A jig (Figure 5) is used for the beveling and sharpening of the steel blade. The steel blade is inserted into the channeled chuck of the jig and held in place by a tension screw on the outside edge of the jig. As the jig is pulled lightly across the sharpening stone, the preset angle of jig's channeled chuck sharpens and bevels the blade's edge to a precise cutting angle.

Lesson 1/Learning Event 2

Auxiliary Aids

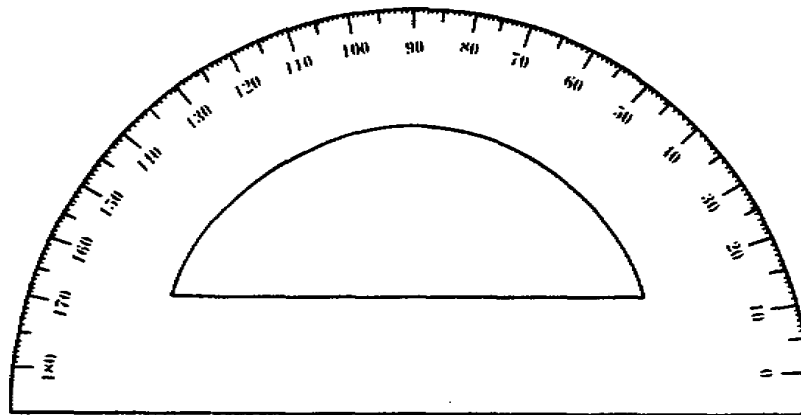
The following is additional equipment used in the color-separation process.

Guides. Drafting triangles, straightedges, and drafting curves (Figure 6) are used as guides to scribe lines of reproduction quality.



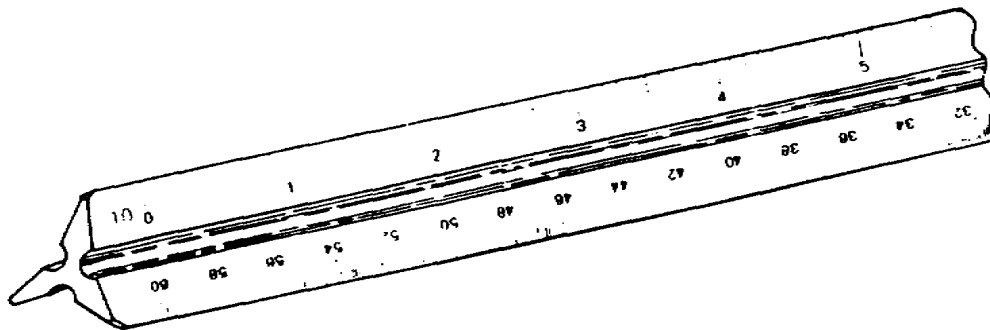
Protractor. A protractor (Figure 7) can be made of wood, plastic, or metal and is used to plot or to measure angles. Metal protractors are the most satisfactory and come in several sizes. The ordinary type is graduated into single degrees, while the more precise type have verniers (sliding scales) attached to permit the plotting or measuring of angles to single minutes or arcs. The usual shape of the protractor is a semicircular arc graduated in degrees from 0 to 180 degrees. The center of the graduated arc is marked so that it may be placed upon the vertex (where the two lines meet) of the angle to be measured or laid off, with the 0 degree of the scale on one leg of the angle.

FIGURE 7. PROTRACTOR



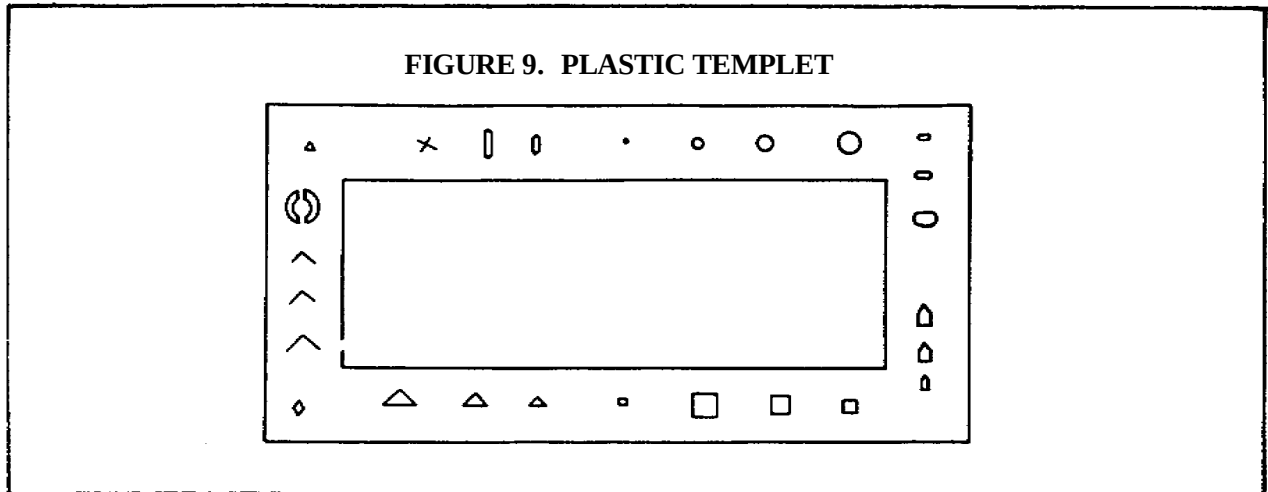
Standard engineer scale. The engineer scale (Figure 8) is used for making measurements when plotting control data by rectangular coordinates. Inches are subdivided into 10, 20, 30, 40, 50, and 60 parts with larger lines for each set of 5 and 10 small units. Engineer scales are also used for laying out the border data for the map sheet with style sheet specifications and for measurements where accuracy is not critical.

FIGURE 8. ENGINEER SCALE



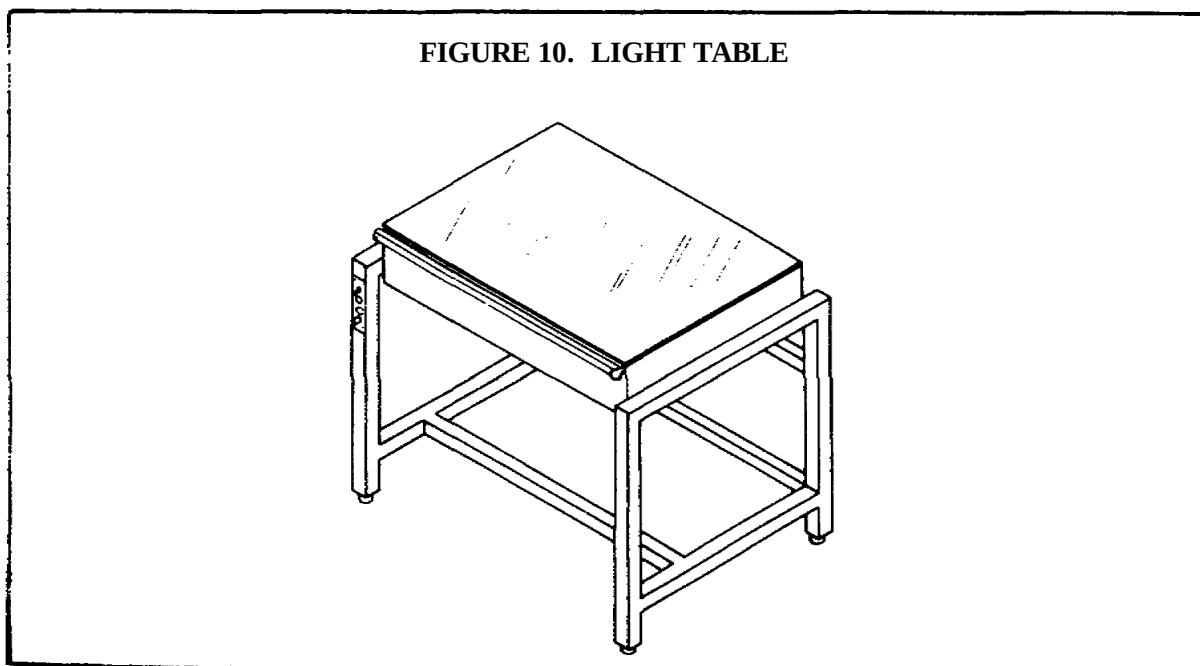
Lesson 1/Learning Event 2

Plastic templet. This templet (Figure 9) is used with the pen-type and rigid gravers. It has cutouts to help the cartographer to produce most of the map symbols that are difficult to scribe freehand.



Light Table

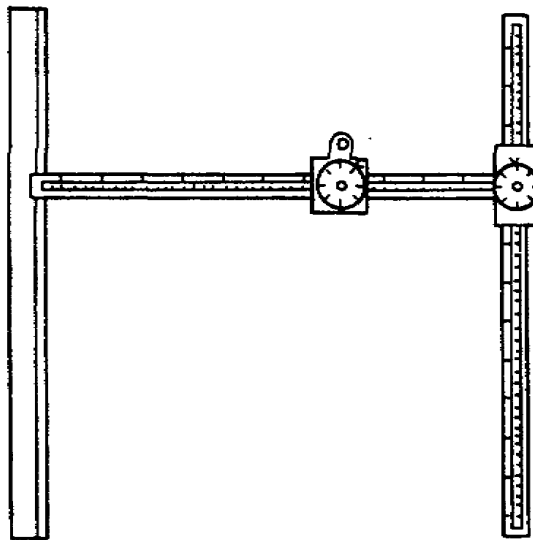
A light table (Figure 10) provides a glare-reduced working surface. The table has a tilt-top with a set-in sheet of glass. The internal lighting usually consists of several fluorescent lamps, preferably of the cold type, placed under the glass top to provide an even distribution of light. Internal reflectors and diffusers also may be used to improve the uniformity of the light. The ideal light table provides an illuminated surface large enough to view an entire sheet of scribecoat at one time. Tables with smaller glass areas are not suitable for registration, editing, and certain quality-assurance functions.



**Learning Event 3:
SPECIAL EQUIPMENT**

The coordinatograph (Figure 11) is a more accurate and faster way to construct a grid net and ground control than the standard hand-held instruments. However, the coordinatograph is not readily available and is mentioned here only as a matter of note. Coordinatographs used by the military range from a small, simple, portable, tabletop instrument to a massive, complex, floor-mounted machine. Although these instruments may vary in size and capabilities, all coordinatographs are designed with the same basic control features for constructing a grid.

FIGURE 11. THE COORDINATOGRAPH



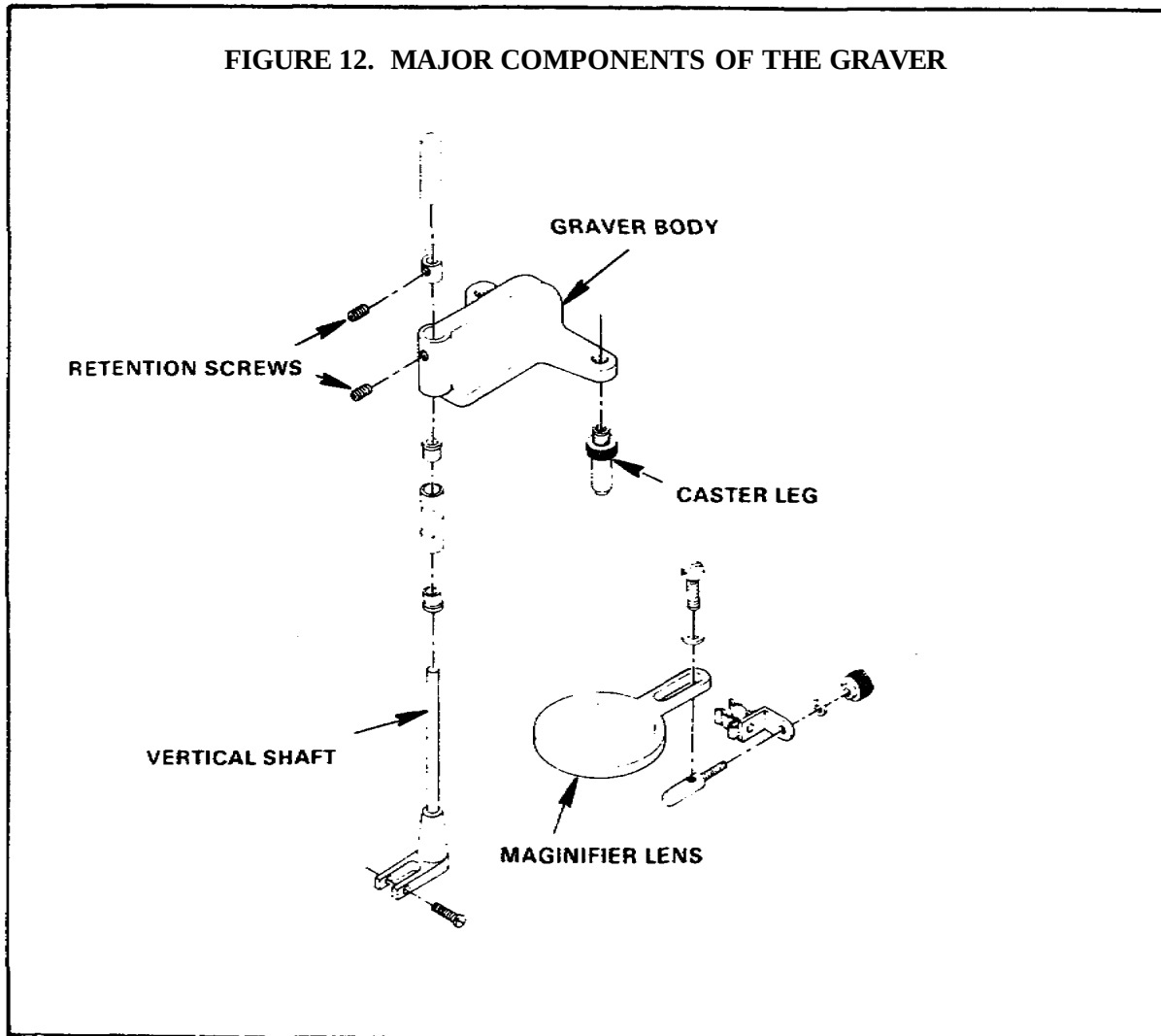
**Learning Event 4:
PREVENTIVE AND OPERATOR MAINTENANCE**

In general, drafting equipment requires very little operator maintenance, due to the simplicity of design and functional requirements. Preventive maintenance of this delicate equipment consists of using the same care and precautions given to all precision instruments.

Gravers

Maintenance checks. Each graver should be checked before attempting to level or operate the instrument. In addition, the following maintenance should be performed.

Clean all movable parts of the graver (Figure 12) with a small quantity of fine watch or instrument oil. Use an artist's brush to sweep dirt particles from the moving parts. If the graver has a magnifier lens, clean the lens with appropriate lens paper. The lens should not be dropped or stored in a position that allows scratching or chipping. Replace any defective parts.



Ensure that the vertical shaft is straight Tighten all retention nuts and screws just enough to prevent the shaft from slipping horizontally or vertically.

Inspect the ball-bearing feet on the caster legs carefully for dirt, rust, or damage. The bearings should rotate freely.

CAUTION: Do not rotate ball-bearing feet across the palm of your hand. This could allow the ball bearings to pick up body salt and dirt, causing the bearings to deteriorate.

Precautions. Take the following precautions while scribing to prevent instrument damage.

Do not allow the graver legs or scribe point to come in contact with any hard, soiled, or abrasive surfaces. This could severely damage the scribe point and ball-bearing feet.

During short pauses or at the end of scribing operations, always place the graver on its side and secure it in a safe place to prevent dropping. Dropping the graver can damage the scribe point or possibly make the instrument irreparable.

Observe the movements and cutting action of the graver for early detection of dirty, worn, or damaged instrument parts.

Since gravers do not come with their own carrying cases, wrap them in a clean cloth and place them in a safe storage container after each use.

Scribing Needles

Phonograph needles (scribe points) are made of extremely hard corundum. They resist wear and breakage, but they do not resist sudden impact. The following steps should be taken to maintain the needles and prevent damage.

Do not drop phonograph needles or allow them to rest on metal or glass surfaces while they are seated in the scribing instruments.

Take particular care to keep the scribing points in the correct holes in the plastic point dispenser.

NOTE: By aligning the hole in the top of the dispenser over the "US" on the body of the dispenser, the points are held securely in place (See Figure 2, page 5.)

Monocular Magnifiers and Optical Microscopes

The highly polished optical lens of these instruments requires certain care for proper maintenance.

Do not drop the lens or store it in a position that allows it to become scratched or chipped.

Clean the lens periodically using only a lens paper or plastic cleaner.

Lesson 1/Learning Event 4

Cases. Leather cases are available to carry magnifiers in the field and to protect the glass from being scratched or chipped. A wooden case is usually available for securing the optical microscope. If a case is not available, wrap the microscope in a clean cloth, and secure it in a safe storage container.

Batteries. Some optical microscopes have a miniature light to illuminate the subject. Batteries should never be stored in the microscope case, but should be removed after each use.

CAUTION: Old batteries may leak or explode, causing severe corrosion and damage to the optical microscope casing and lenses. Never use old batteries in these microscopes.

Sharpening Stones

Wash these stones periodically with cold water to remove metal shavings and foreign material that may clog the stone's pores. Lightly apply oil to help retain the stone's coarseness.

Do not drop sharpening stones. Do not use excessive pressure as such may cause cuts and scars to the stone's surface.

Jig

A small application of instrument or watch oil around the spindle and chuck-retention screw is usually the only maintenance required.

Use extreme care while tightening the retention screw to avoid stripping the threads of the screw or the threaded hole in the chuck.

Never leave a steel blade in the jig during storage. This can cause damage to the blade and possibly damage the chuck holding the blade.

Steel Scribing Blades

Steel blades are also made of an extremely hard corundum that resists wear and breakage. The blades may be damaged if they receive a sudden impact

Do not drop the blades or allow them to rest on any hard or abrasive surfaces while seated in the scribing instruments.

Do not store steel blades in the plastic point dispenser. Store them in a small paper envelope or another suitable storage container. Separate the blades and mark the containers to keep the blades in order.

Plastic Guides (Drafting Triangles, Curves, and Engineer Scales)

Take special care while handling any type of plastic guides to avoid chipping, scratching, or breaking them. Store plastic guides on a smooth, level surface away from direct sunlight and excessive heat to prevent warping.

Never use a sharp or abrasive instrument to cut along the edges of the plastic guides. This will distort the guide's edge and make the plastic guide useless. Replace any plastic guides which have been gouged, chipped, cracked, or distorted along their edges.

Clean plastic guides with a plastic cleaner or a damp cloth with a mild detergent. Dry them with a clean, soft cloth. Place guides in a protective wrap (paper, plastic, or cloth). Put them in an instrument tray or special cabinet drawer to prevent surface abrasion.

Metal Guides (Straightedges, Triangles, and Curves)

These guides may be used with a drawing or a cutting instrument, but their edges may be nicked, dented or distorted. Take particular care if their edges are to be used as a cutting guide. These instruments are made from a special metal alloy which prevents oxidation and corrosion of the metal surfaces.

After each use, wipe the instruments with a clean, soft cloth to remove corrosive fingerprints and salt deposits. Use metal polish to remove heavily soiled spots and areas of rust or corrosion. Dry the metal guides with a clean, soft cloth.

CAUTION: Oil should not be used on these instruments, since it will accumulate in the metal's pores and leave an oil deposit on mapping materials.

Place the instruments in a protective wrap, and secure them in a special cabinet drawer to prevent bumping or denting their edges.

Light Table

Check for broken switches, frayed light cord, and cracked or chipped tabletop glass before turning on the power. Correct any problems before using the equipment.

Never place heavy or abrasive materials on top of the table which could break or scratch the glass surface. Clean the glass surface with a glass cleaner, and wipe it dry with a clean, soft cloth after each use.

Turn off the power, and secure the light cord to prevent accidental injury to personnel when the table is not in use.

Lesson 1/Learning Event 5

Learning Event 5: TECHNICAL MANUALS, PUBLICATIONS, AND RELATED MATERIAL

The scribed negatives, special negatives, and overlays produced in the color-separation phase of map production are the final phase of the map detail before it will be printed. The appearance and accuracy of the printed map depend on the care with which the cartographer interprets the map manuscript and the skill with which the drafter grades and symbolizes the selected features. Various publications have been issued which establish the preferred procedures, symbolization, colors, and format to be used for each of the standard military map scales and series.

Technical Manuals

Technical manuals provide instructions, procedures, quality performance measures, product specifications, and guidelines to follow throughout each phase of the map-making process.

TM 5-240, Compilation and Color Separation of Topographic Maps

This manual-

Is used for reference and guidance by all cartographers who compile maps and prepare color separation materials.

Provides a single text on methods and techniques of map and photomap compilation, map revision, color separation, and map editing.

Describes the construction of map projections and grids; the compilation and revision of maps from aerial photographs and other source materials; color separation by scribing techniques; and the preparation of photomosaics, annotated photographs, hasty maps, and other map substitutes.

TM 5-241-1, Grids and Grid References

This manual-

Is used for reference and guidance by all cartographers who plot and construct the grid and projection graticules (a network of lines of latitude and longitude).

Provides information concerning US Army Military Grid Reference System and British Grid Reference Systems, using the Universal Transverse Mercator (UTM) and Universal Polar Sterographic (UPS) grid.

Describes the basic principles of the UTM and UPS grids used in the US Army Military Grid Reference System and standard methods for determining references. Explains the notes and diagrams which supplement the grids.

Contains the identifications of the Grid Zone Designations and the 100,000-meter squares of the UTM and UPS grids. Gives additional data necessary to prepare the grid compilation and use the references system.

TM 5-245, Offset Photolithography and Map Reproduction

This manual-

Serves as a reference and a guide for training personnel in the reproduction of copy by offset photolithographic methods.

Emphasizes the reproduction of maps and related materials by topographic units, but also discusses lithographic printing by other military lithographers.

Describes the photolithographic method of reproducing maps, photomosaics, books, pamphlets, forms, and similar material of a military nature.

Discusses the principles involved in each of the major phases of the photolithographic process. Provides general instructions on equipment operation.

DMAHTC TM (Defense Mapping Agency Hydrographic/Topographic Center, Technical Manual), Specifications for Military Maps

This manual-

Provides the basic specifications for military and special-purpose maps prepared by DMAHTC and other Corps of Engineers topographic units.

Describes the DMAHTC basic requirements for the design and content of worldwide mapping at all standard military scales.

Prescribes the symbolization for authorized special maps and map substitutes. Treatment of features unique to an area may not be covered in this manual.

Includes style sheets with complete instructions to depict the grid, and indicates the composition and arrangement for all marginal data.

Other publications

The following publications contain current changes and additions to TMs. Use these publications with the corresponding manuals.

PS/3AA/101, Defense Mapping Agency Product Specifications for 1:50,000 Scale Topographic Maps of Foreign Areas

This manual applies to the production of all new 1:50,000 scale topographic maps of foreign areas and revised 1:50,000 scale foreign topographic maps designated as Tactical Land Combat and Tactical Air Operations.

Appendix II of PS/3AA/101

This material is used to prepare or revise all domestic 1:50,000 scale topographic maps. It should be used with either DMAHTC TM S-1 or United States Geological Survey 1:50,000 scale specifications.

Lesson 1/Learning Event 5

Special Project Instructions

Supplementary instructions are used with the project work order and are prepared by either the requesting agency or by the operations element of the topographic unit.

These instructions pertain only to the specific project. They contain any revisions to the standard symbolization shown in the basic specifications and style sheets. They outline the preferred treatment for unusual conditions which may occur in the project area and which are not covered in the standard specifications.

NOTE: Study the project instructions carefully. Be sure you completely understand the instructions before starting the scribing, since they supersede any conflicting information in the standard specifications.

Lesson 1
REVIEW EXERCISE

Check your understanding of instructional materials for Lesson 1 by completing the review exercise without looking back at the lesson. When you have completed as many of the questions as you can, check your responses. If you do not understand a solution, go back and restudy the part in the lesson where the information is given. Solutions follow the review exercise.

1. Peelcoats are used to make an _____ negative.
2. Spade and multiple line blades are the two types of steel blades used in _____.
3. The rigid graver is used for engraving_____ features up to 0.010 inch in weight.
4. The cartographer uses a plastic templet with the _____ and _____ gravers to produce most of the map symbols that are difficult to scribe freehand.
5. Methods and techniques of map and photomap compilation, map revision,_____ and map editing are covered in TM 5-240.
6. Which instrument is used to magnify scribed line work for visual verification of line weight and to plot points accurately to within .010 inch (0.25 millimeter)?
 - A. Magnifier lens
 - B. Monocular magnifier
 - C. Optical microscope
 - D. Metric scale
7. Which material is used to make deletions and moderate corrections to scribe detail when line weights exceed 0.010 inch (0.25 millimeter)?
 - A. China marker
 - B. Ink
 - C. Opaquing pencil
 - D. Opaquing fluid
8. Which instrument can be used for scribing tapered streams, freehand symbols, and for the touch-up and correction of existing line work?
 - A. Etching knife
 - B. Combination graver
 - C. Pen-type graver
 - D. Protractor
9. Instruments equipped with a highly polished optical lens should periodically be cleaned. Which of the following should be used?
 - A. Artist's brush or clean cloth
 - B. Soft cotton and glass cleaner
 - C. Lens paper

D. Water and a dry cloth

Review Exercise Solutions

10. Which items are not stored in the plastic point dispenser?
- A. Twelve scribing points
 - B. Swivel chuck for the combination graver
 - C. Detachable pin for the swivel chuck
 - D. Six steel blades

REVIEW EXERCISE SOLUTIONS

- 1. Open-window (page 2)
- 2. Color separation (page 5)
- 3. Single line (page 3)
- 4. Pen-type, rigid (page 10)
- 5. Color separation (page 16)
- 6. C, Optical microscope (page 6)
- 7. D, Opaquing fluid (page 2)
- 8. C, Pen-type graver (page 3)
- 9. C, A lens paper (page 13)
- 10. D, Six steel blades (page 14)

**LESSON 2
PREPARATION FOR SCRIBING**

OBJECTIVE

Describe the basic methods of scribing, including sharpening, leveling, and troubleshooting equipment. Describe good scribing practices and techniques used for maximum scribing efficiency.

TASKS

Identify procedures for leveling the graver and sharpening a needle point or steel blade edge. Demonstrate knowledge of good scribing practices and techniques.

CONDITIONS

You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. Complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS

You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

CREDIT HOURS

2

REFERENCES

TM 5-240, Compilation and Color Separation of Topographic Maps
STP 5-81C1-SM, Cartographer
STP 5-81C24-SM-TG, Cartographer

Lesson 2/Learning Event 1

Learning Event 1: GENERAL

The scribing method is the most widely used color separation method for map reproduction and is the standard method in military units. It involves engraving selected portions of an image, processed on a coated plastic base, to form a negative. The base is a dimensionally-stable (produces no distortion) transparent plastic sheet. The coating may be any color, but is usually matte-finish orange. Regardless of color, the coating must be opaque to certain light rays.

The manuscript image is processed in reverse on the coated side. Each image is used for a separate color and the coating is cut away wherever a line is to be printed in that color. The cutaway lines are the only portions of the image that will print. The resulting engraved plastic is in negative form and may be used directly to make the press plate.

The chemicals and techniques used to apply the scribing image to the coated plastics are described in TM 5-245, Offset Photolithography and Map Reproduction.

Learning Event 2: SHARPENING THE EQUIPMENT

Phonograph needles and steel blades must be ground to specific line weights and precise shape, and sharpened to the most effective cutting angles to scribe uniform lines.

Phonograph Needle

The phonograph needle is inserted into the chuck of the rigid graver to a depth that will allow the base of the instrument to be parallel to the scribing surface. The legs on most gravers have been set by the factory but may be adjusted for smoother operation. The legs of the graver are placed on the plastic base of the sharpening block with the needle on the sharpening stone. The needle is sharpened by moving the graver in a circular motion allowing the weight of the graver to do the sharpening.

NOTE: Do not apply pressure to the graver.

The weight of lines drawn with new needles ranges from 0.002 inch to 0.003 inch. A few turns on the sharpening stone will change the line weight by about 0.001 of an inch. Microscopic examination will reveal the weight of the engraved line as well as any defects. You should alternate sharpening and checking until the desired line weight is obtained. If the line becomes too wide, another needle must be used because it is impractical to decrease the line weight and maintain a perfectly round needle.

The cutting ability of the round point is checked by scribing in all directions, maintaining the same line weight and ensuring both edges of the cut line are clean.

Needles wear due to the abrasive action of the scribe-coat emulsion. Frequent checks of the line weight should be made using the optical microscope.

Sapphire and Ruby-Tipped Points

These points come presharpenered from the factory. Worn or broken jewel points should be replaced, not resharpened.

Steel Blades

All blades are delivered presharpenered; however, examination of lines engraved with a new blade may reveal the blade's edge needs to be refined. This can be done with a jig and sharpening stone using the following method.

Secure the blade in the jig with the beveled edge of the blade face down.

Pull the jig lightly over the sharpening stone a couple of times.

Insert the blade into the graver's chuck and remove any metal barbs from the blade's edge with a piece of 4/0 emery cloth.

Lesson 2/Learning Event 2

When sharpening double tib blades, keep in mind that each tib should measure the same width. Example: Assume that each fib measures 0.022 inch with a 0.014-inch space between tibs. The space between the tibs may be widened by using 4/0 emery polishing cloth. Carefully draw the emery paper between the fibs of the blade until each fib measures 0.004 inch.

NOTE: To prevent dulling or damaging the scribe point or blade, never drop nor set the graver in an upright position on a hard surface.

**Learning Event 3:
LEVELING THE GRAVER**

The graver must be leveled before engraving a plastic sheet. The graver is considered leveled and the scribe point balance correct after a test cut has been determined to be clean and of a constant line weight. The scribing must be smooth flowing and easily maintained throughout a 360-degree pattern. The following procedures are used to level gravers.

Seat the Point and Blade

Lay the graver on its side allowing easy access to the chuck and tension retaining screw. Insert a presharpener point or blade into the chuck's channel. Make sure it is fully seated and the beveled edge of the steel blade is pointed toward the graver's vertical shaft. Be careful not to strip the threads of the chuck and the tension retaining screw; tighten the screw just enough to firmly secure the point or blade into the chuck. (See Figure 13 and Figure 14, page 26, for the proper installation of the scribe point and steel blade.)

FIGURE 13. SEATING THE SCRIBE POINT

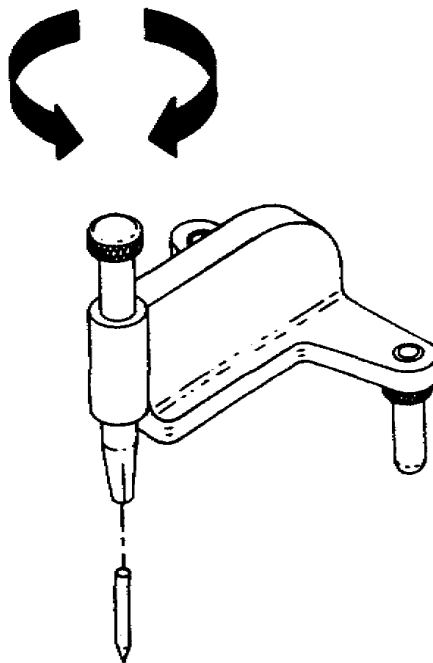


FIGURE 14. SEATING THE STEEL BLADE

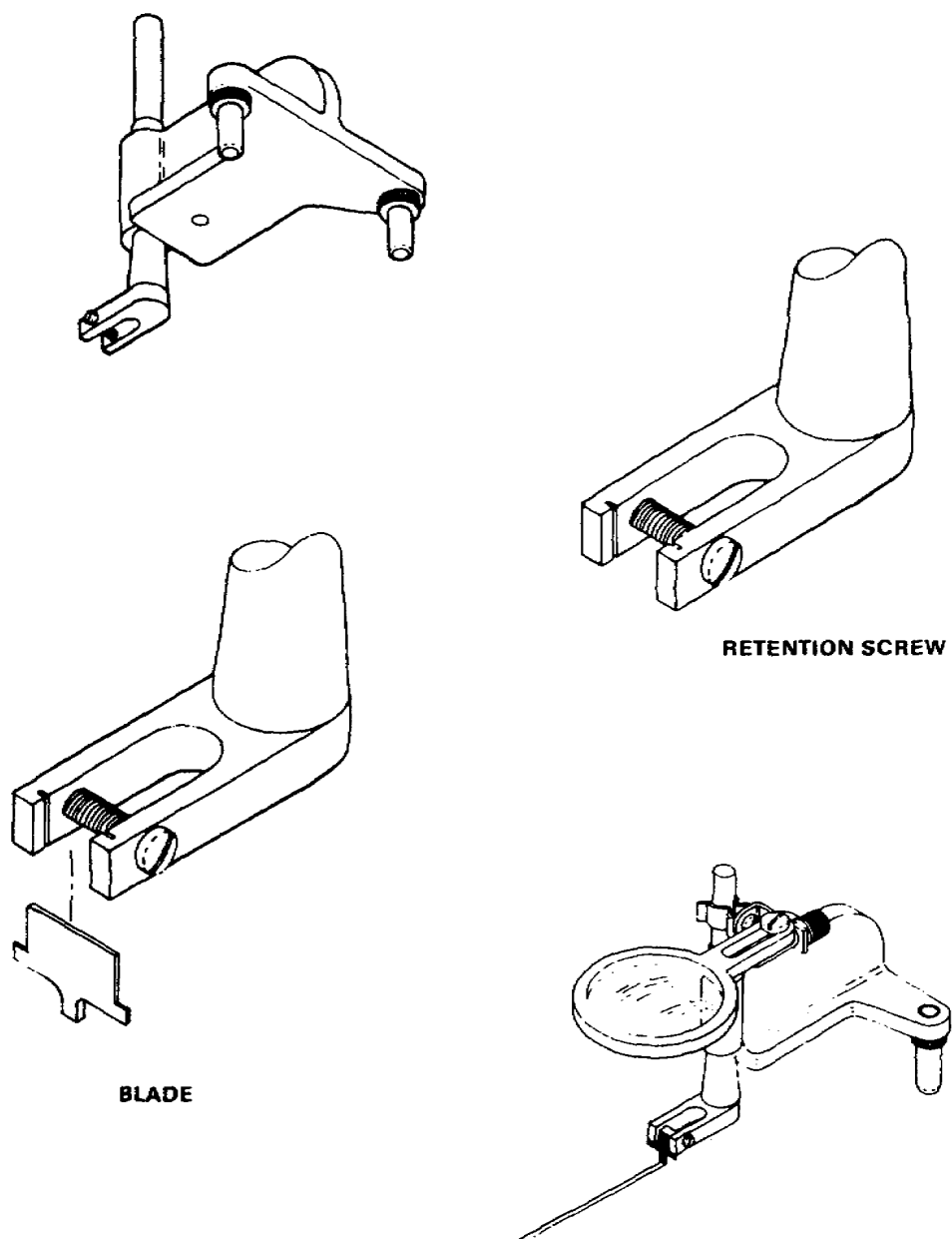
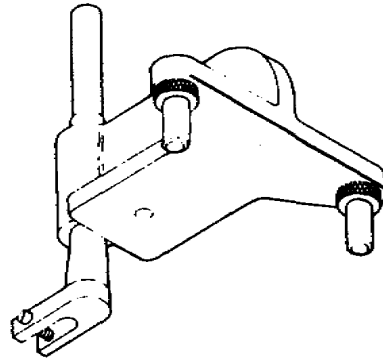
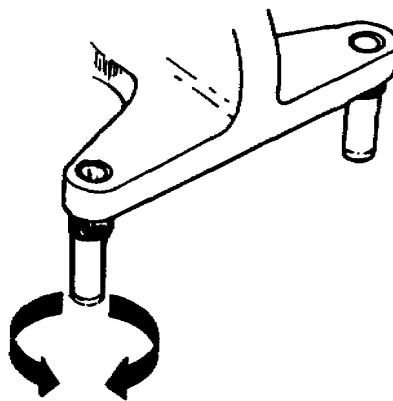


FIGURE 15. CASTER LEGS**Synchronize the Caster Legs**

Each graver has its own built-in scribing characteristics patterned after its functional design. This design is altered by the unavoidable tolerance differences manufactured in each graver and accessory parts that are produced at the factory. Each caster leg should be synchronized with the graver plate to allow for the graver and part differences. This will balance the graver part tolerances, eliminate their effect on leveling the graver, and increase the precision of the graver. The following procedure will synchronize the caster legs: Locate the two adjustable caster legs positioned at the back edge of the graver plate (Figure 15). Turn the caster legs clockwise until the threaded ends are flush with the top of the graver plate (Figure 16).

FIGURE 16. ADJUSTING THE CASTER LEG

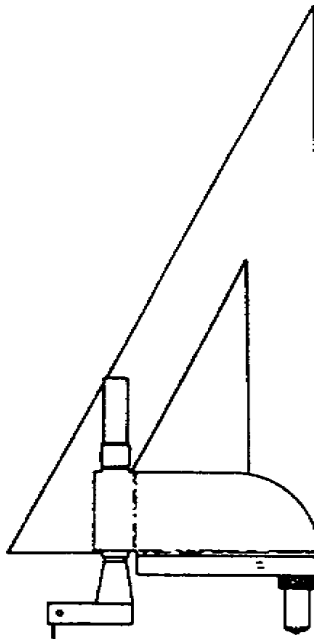
Lesson 2/Learning Event 3

Check the Horizontal Level

Use two 90-degrees drafting triangles to determine the graver's tolerances while you make appropriate adjustments to level the graver. The triangles should be slightly longer than the linear distance of the graver to be leveled. Short triangles do not provide an accurate leveling measurement and are very difficult to handle. Use the following procedures (steps 1, 2, and 3) explained below to check the horizontal level.

Step 1, set the graver upright in a normal position on a piece of scribecoat. Lay a triangle's base edge across the graver plate's surface with the triangle's face tangent to the vertical hand grip on the graver. The vertical edge of the triangle must be even with and perpendicular to the back edge of the graver plate (Figure 17).

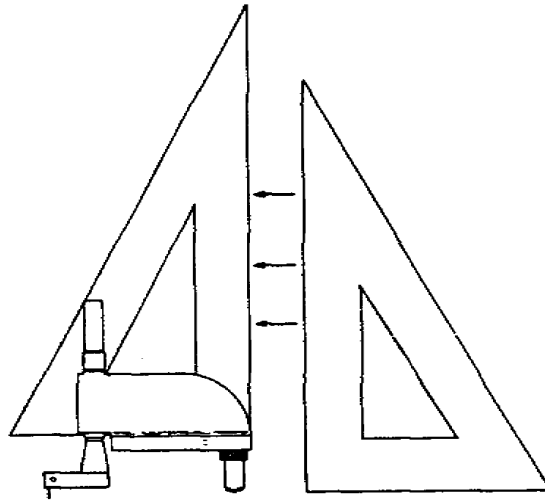
FIGURE 17. PLACEMENT OF THE FIRST TRIANGLE



Step 2, keep the first triangle in position on the graver plate. Place another triangle with its base on the scribecoat and its vertical edge turned toward the first triangle's vertical edge (Figure 18).

Step 3, keep both triangles vertical and flush with the surface they are setting. Move the outside (second) triangle in toward the back edge of the graver plate until the vertical edges of the triangles touch. Ideally, the triangles would touch along the entire vertical edge. If not, adjustments must be made.

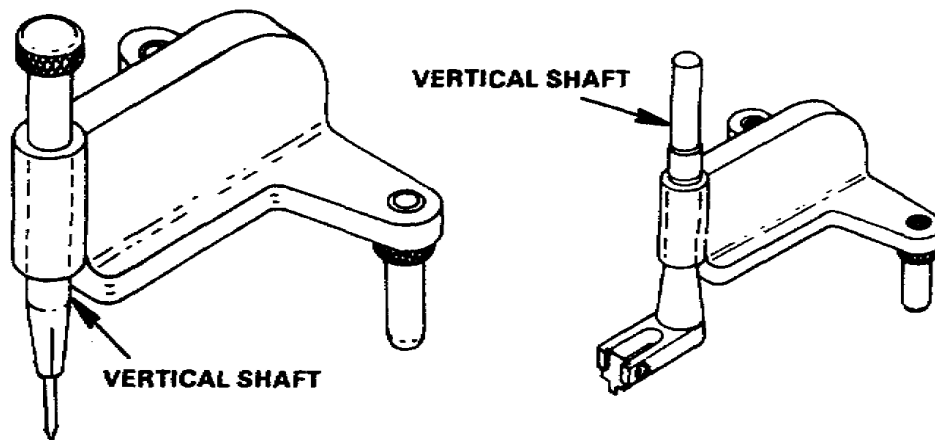
FIGURE 18. PLACEMENT OF THE SECOND TRIANGLE



Adjust and Check the Horizontal Level

The horizontal level is adjusted by raising or lowering the vertical shaft on the graver (Figure 19).

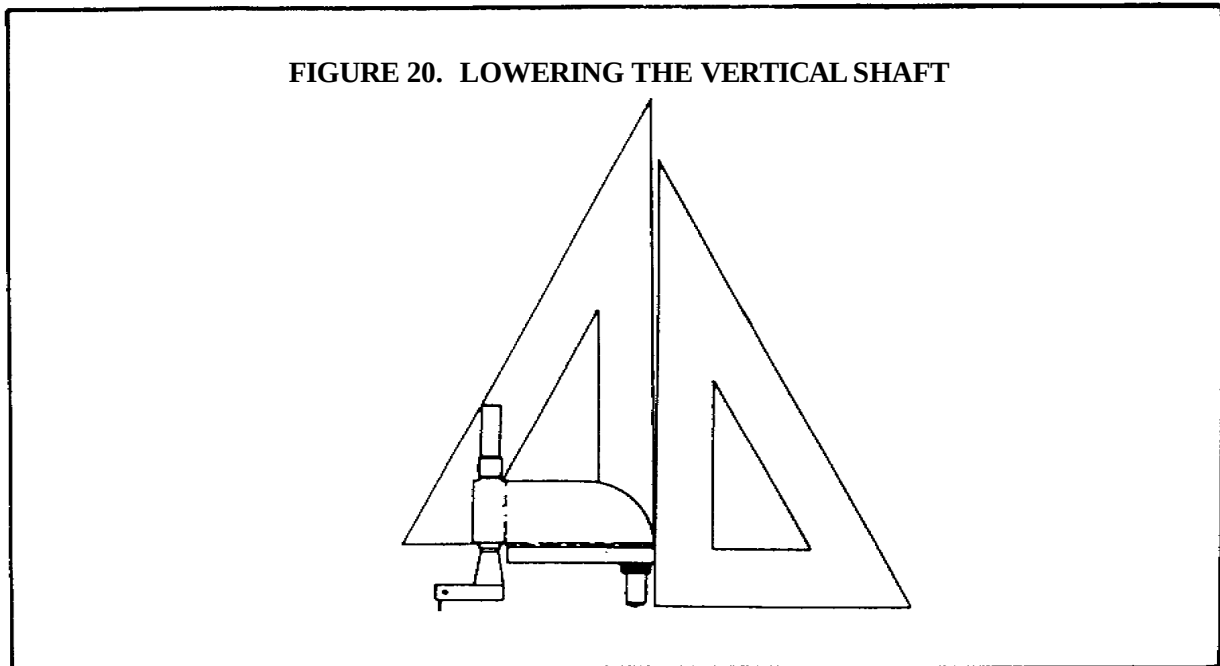
FIGURE 19. VERTICAL SHAFTS ON THE GRAVERS



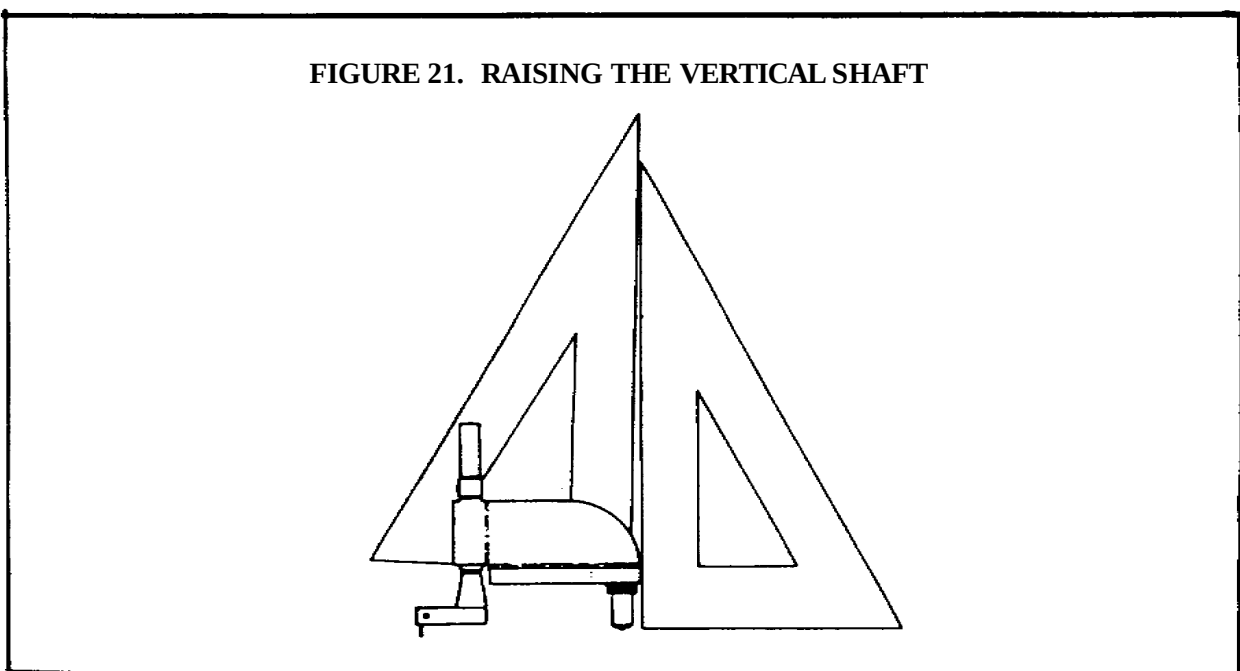
Lesson 2/Learning Event 3

To adjust the vertical shaft, first determine if it must be raised or lowered. This determination would be made when the horizontal level is checked.

If the triangles have a gap at the top, the vertical shaft must be lowered to raise the front of the graver (Figure 20).



If the triangles have a gap at the bottom, the vertical shaft must be raised to lower the front of the graver (Figure 21).



To lower or raise the vertical shaft, loosen the allen retention screw, using an allen wrench (Figure 22), just enough to allow the vertical shaft to move up and down freely. Raise or lower the vertical shaft a small amount, as required, and retighten the retention screw. After each move of the vertical shaft, a check of the horizontal level must be made until the space between the vertical edges of the triangles is closed. The triangles must meet along the entire vertical edge (Figure 23).

FIGURE 22. LEVELING THE GRAVER

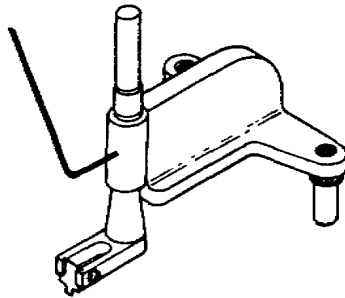
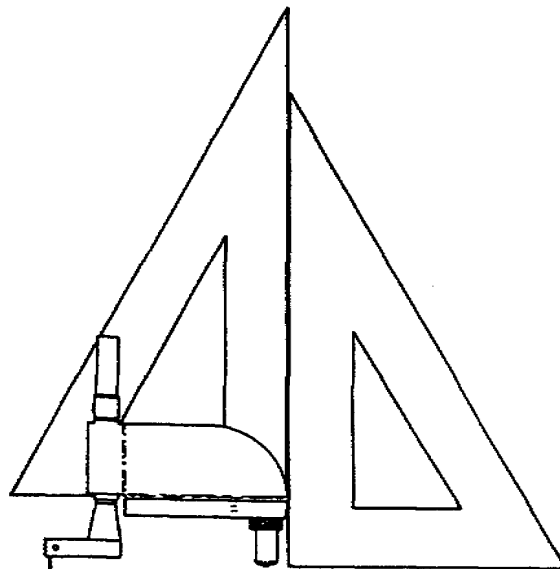


FIGURE 23. FINAL LEVEL CHECK

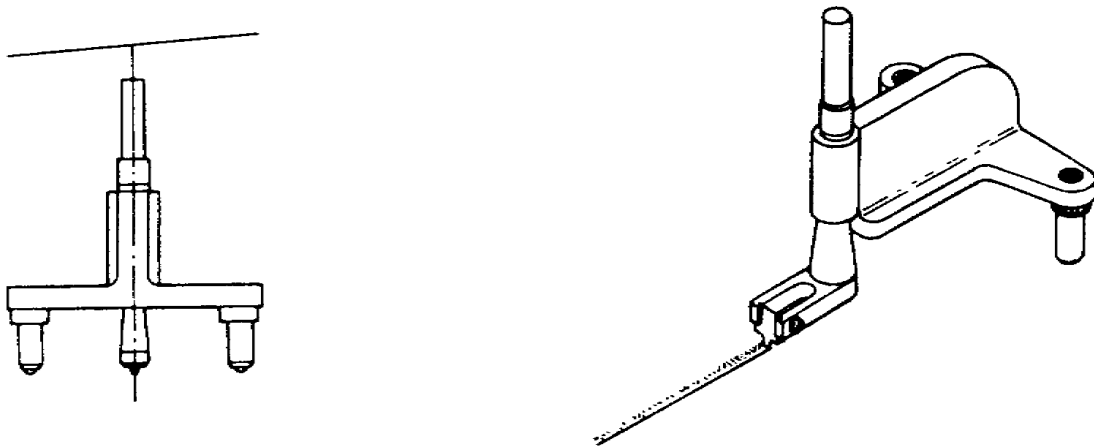


Lesson 2/Learning Event 3

Check the Balance

Checking the balance is required for the swivel and combination graver. To check the balance, turn the graver's chuck to the normal position and scribe a few test lines. Check for any flaws along the channel edges of the test lines with the use of a monocular magnifier. If the test lines have a clean cut edge on one side of the channel and feathered on the opposite edge (Figure 24), this indicates the graver plate is slightly lower on the clean cut side of the channel.

FIGURE 24. CHECKING THE BALANCE OF THE GRAVER

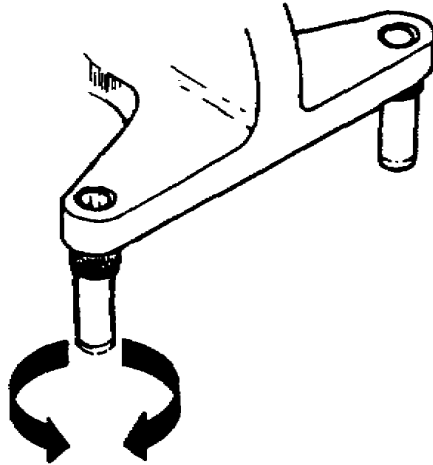


Adjust the Balance

To correct discrepancies in the balance, found while checking the graver, use the following procedure.

Locate the lock screw for the caster leg on the high side. Turn the lock screw a fraction of a revolution in a counterclockwise direction (Figure 25). This will lower the high side. Each time the lock screw is adjusted, scribe a new test line. Leveling is complete when a test line can be cut clean with a constant line weight and engraving is smooth and easy flowing.

FIGURE 25. ADJUSTING THE BALANCE OF THE GRAVER



The procedure for leveling the graver is a trial and error process. Patience must be exercised during the procedures. The leveling procedure becomes easier with experience and as knowledge of the instrument's characteristics expands.

Lesson 2/Learning Event 4

Learning Event 4: TROUBLESHOOTING

Should leveling methods fail to give satisfactory scribing results, a damaged graver or defective parts are the probable cause. Listed below are some problems and possible causes. This list should assist you in determining what area needs to be repaired.

Problem	Possible Causes
Irregular and floating line path	Loose or damaged tension screw in vertical cylinder head. Missing or worn teflon bushing. Loose casts or worn ball bearing foot.
Scarred and jagged cut line	Dull point or blade. Metal barb on point or blade. Bent point or blade. Incorrect cutting angle on point or blade. Bent vertical shaft or chuck.
Continuous drag or stiff motion	Dull point or blade. Dirty or worn ball bearing feet. Dirty or bent vertical shaft or chuck. Allen tension screw too tight in cylinder head. Dirty or worn teflon bushing. All moving parts need oiling.

Learning Event 5:
USING GOOD SCRIBING PRACTICES

A large scribing operation can place substantial mental and physical demands on the cartographer. Common symptoms of fatigue and stress often begin to appear after the first hour of scribing, and increase as continuous work and time elapse. Establish practical procedures to be used during scribing as preventive measures against fatigue. Use normal good health and exercise practices, as well as common sense and good scribing techniques.

Practical Procedures

Graving instruments, materials, and other items used for scribing should be prepared and readily accessible.

Review the special project requirements before beginning. Be aware of the scribing requirements needed for the job.

Research all reference, specifications, or other material before beginning the scribing process.

Good Health Practices

Establish routine rest breaks. Use this time to relax. Move away from your work area for a few minutes. This will help you relax and refresh your physical and mental alertness.

Maintain Good Scribing Techniques

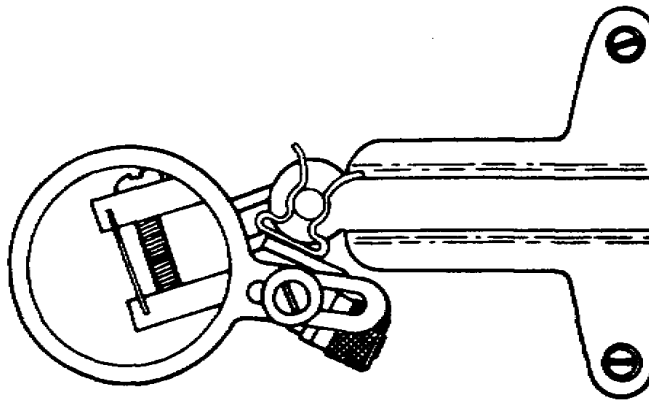
It is important to maintain good scribing techniques and practices. They can prevent or lessen mental and physical exhaustion during the scribing operation.

Ensure light tables are fully operational, lights are bright, burned out bulbs are replaced, and tabletop glass is clean.

Mask out the excess light around the outside edges if a scribe flat does not completely fill the top of height table. This will cut down on the amount of unfiltered glare the eyes receive during the scribing.

Clean the lens if the gravers are equipped with magnifier lenses. Adjust the lens over the scribe point so a correct line of sight and maximum field of view is obtained. To prevent distortion, the line of sight should be viewed straight through the center of the focal point in the magnifier lens (Figure 26, page 36) and down to the scribing point.

FIGURE 26. VERTICAL LINE OF SIGHT



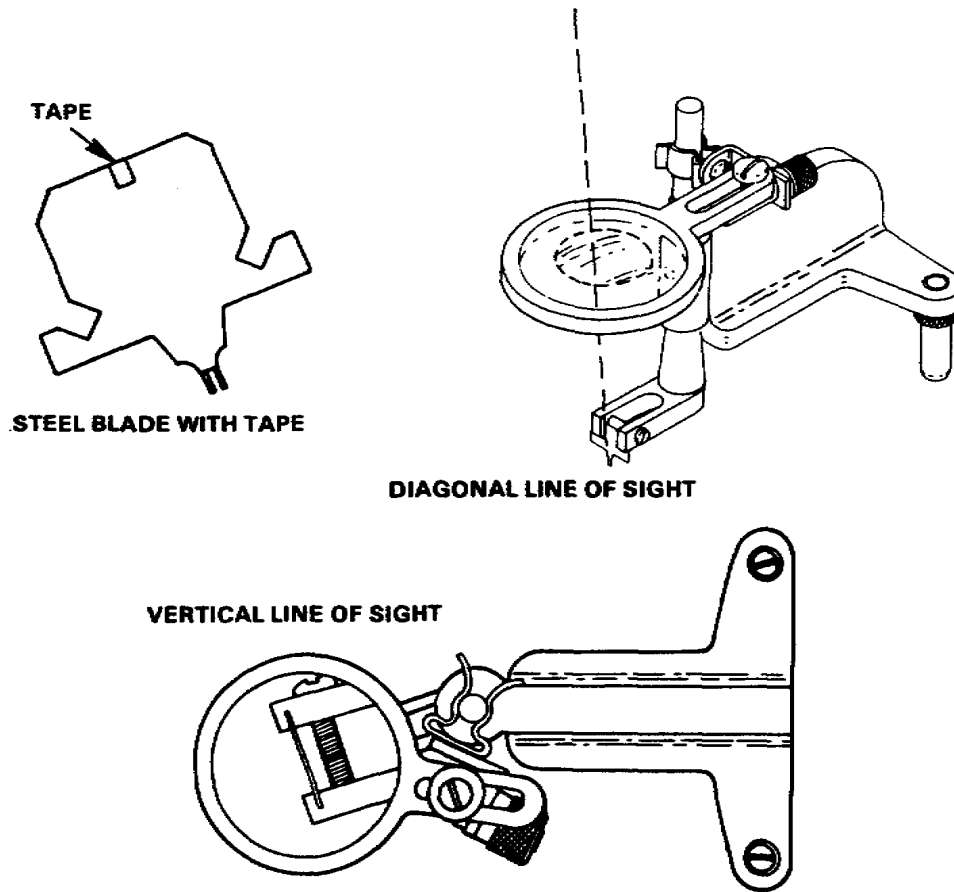
Diagonal line of sight. In Figure 27, the magnifier lens on the graver is positioned close to the graver's vertical shaft, enabling the inside edge of the steel blade to be viewed from a diagonal line of sight (Figure 27). The magnified field of view, as seen through the magnifier lens, enlarges the scribe image detail and the steel blade tibs, while also allowing the maximum expansion of the focal point within the field of view. Although the diagonal line of sight produces a sufficient field of view, this method for viewing the scribe image area has some disadvantages and limitations.

The line of sight must be held at a constant angle, passing through the focal point of the magnifying lens to the scribe point. Detail within the field of view can become progressively out of focus as viewed more toward the outside edges of the magnifier lens.

Should the angle for the line of sight be increased or decreased, the detail within the field of view can become distorted.

The dark color of both the steel blade and the scribe image do not always provide enough contrast to clearly define the outline of the tibs on the steel blade.

FIGURE 27. LINE OF SIGHT



Vertical line of sight. The magnifier lens on the graver is positioned out and away from the vertical shaft of the graver (Figure 27). The vertical line of sight requires the focal point of the magnifier lens to be centered directly over the scribe image area. A piece of white paper or tape of the same width as the tib on the steel blade is cut, aligned, and glued along the inside face of the steel blade. The paper serves as a guide or marker for alignment. This special preparation of the steel blade, as well as the vertical line of sight method, has several advantages over the diagonal line of sight

The vertical line of sight passes directly through the center focal point of the magnifier lens down along the inside face of the steel blade and onto the scribe image area. Using this angle of sight is more natural and very easy to maintain throughout the scribing operations.

Since the line of sight is perpendicular to the horizontal plane of the magnifier lens, exceptional depth, clarity, and a wider field of view can be achieved.

Learning Event 6: SCRIBING TECHNIQUES

Scribing Specifications

Scribing symbolization and line weight specifications for all features are taken from DMAHTC TM S-1, or the project instructions. The national map accuracy standard, as outlined in DMAHTC TM S-1, requires that all features be located within 0.02 inch of their geographic positions. Exceptions are those features unavoidably displaced by exaggerated symbolization. Scribing is a skill that can only be developed through extensive practice. The following techniques will help you to develop your scribing ability.

To begin scribing, center the graver on the image line, and gently push the graver forward to cut into the emulsion. Pull the graver, applying a minimal amount of pressure along image line, maintaining a constant line weight. Upon completion, wipe residue from scribed line. The scribed line should feel smooth to the touch. When viewed through a filter, the line should be cut clean with no jagged or feathered edges or variances in line weight (see Figure 24, page 32). If the line feels rough or appears scarred or feathered, refer to Learning Event 4, Troubleshooting, page 34.

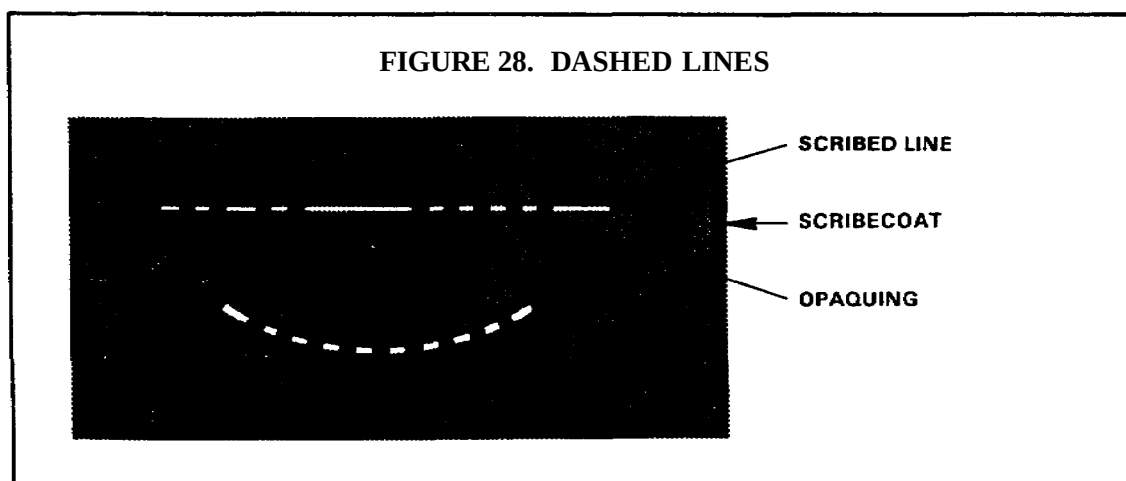
To assure a smooth line, always scribe image lines in a continuous motion. If it is necessary to pause, stop at a break point such as where two image lines intersect.

Irregular or sharply curved lines are scribed freehand with the pen-type graver or rigid graver, depending on the weight of the line and cartographer's preference.

Smooth, curved lines require the use of a drafting curve with the above graves, or may be executed freehand with the combination or swivel graver.

All straight lines must be scribed with the aid of a straightedge.

Dashed lines are usually made by scribing solid lines then blocking out the required spaces with opaquing fluid (Figure 28).



Irregularly curved lines of very short dashes are more easily scribed than blocked out.

Single dots or irregular dotted lines are scribed with a mechanical dotter.

Road intersections are cleared by opaquing the scribed lines within the intersection (Figure 29).

Tapering of streams is accomplished by gradually reducing the line weight from 0.008 inch to 0.006 inch to 0.004 inch in a distance of approximately 0.5 inch (Figure 30).

Most of the small symbols are scribed using the pen-type or rigid graver with a symbol temple. Certain symbols, such as route markers, are available in positive form on a wax-backed Celanese, similar to type stick-up, and are placed on the type overlays.

FIGURE 29. ROAD INTERSECTIONS

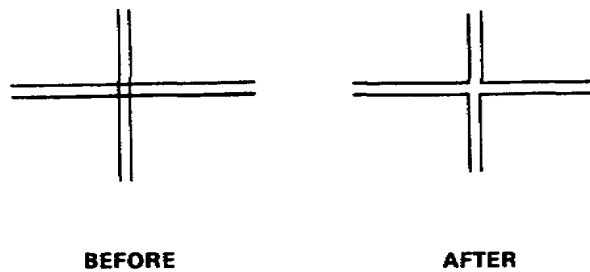
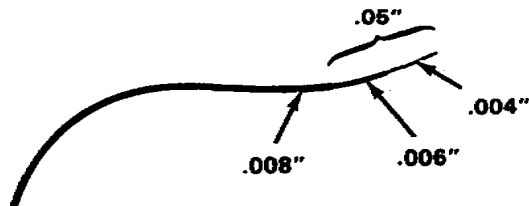


FIGURE 30. TAPERING STREAMS



Standard of Scribing Techniques

Figure 31 shows acceptable and unacceptable scribing techniques.

Linear or area outline symbols are made up of dashes, wholly or in part, that abruptly change direction at a dash-not a space-even if exaggeration of the dash is necessary. Linear symbols are made up partially of dashes that join, intersect, or abruptly change direction at a component part of the symbol-not at a space or dash.

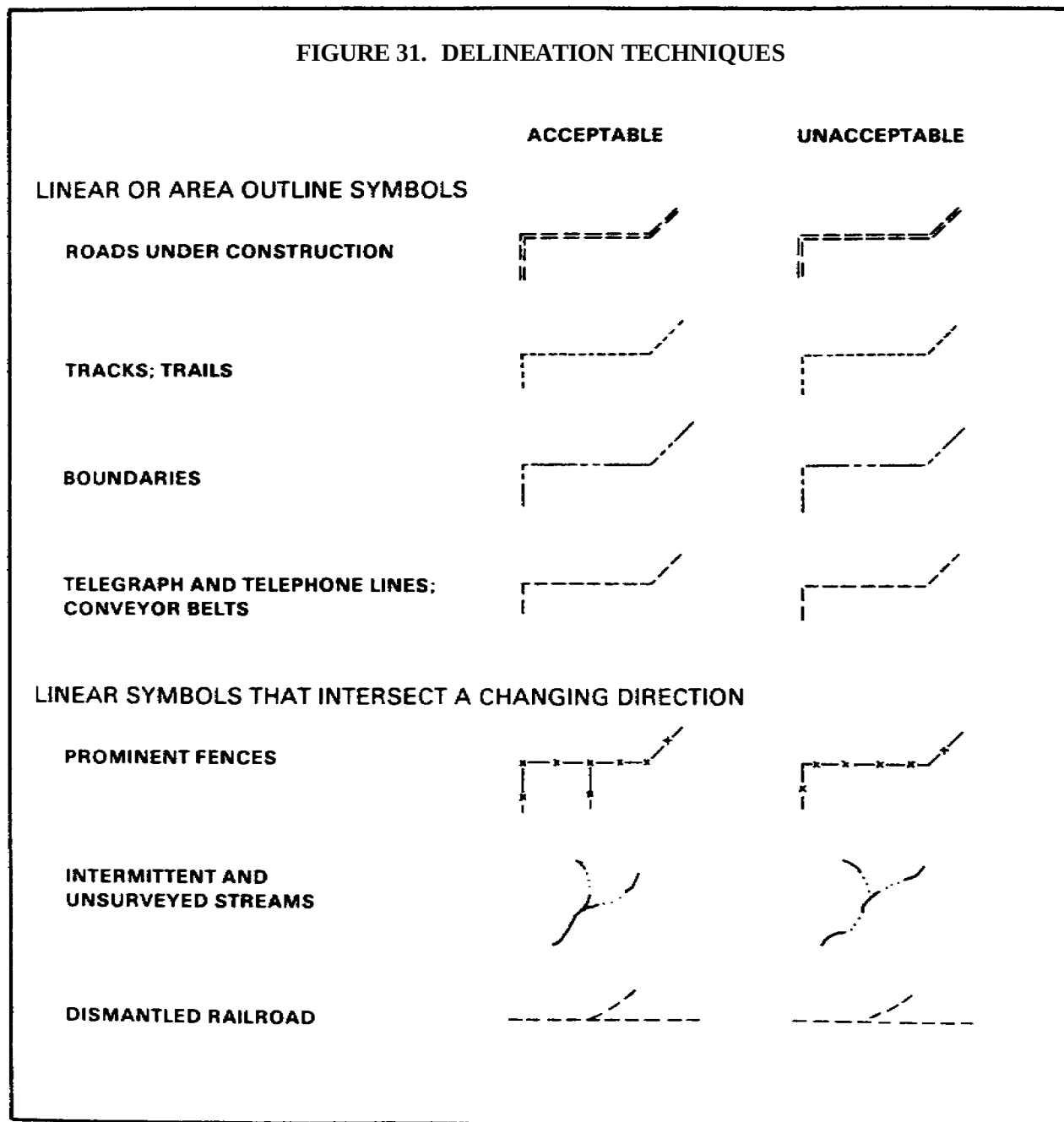


FIGURE 31. DELINEATION TECHNIQUES (CONTINUED)

	ACCEPTABLE	UNACCEPTABLE
LINEAR SYMBOLS WITH MODIFIED CONNECTIONS		
RAILROADS		
ROADS - CASED ROADS OF DIFFERENT WIDTHS		
ROADS - CASED ROADS CONNECTING MONOLINEAL ROADS		

FIGURE 31. DELINEATION TECHNIQUES (CONTINUED)

	ACCEPTABLE	UNACCEPTABLE
SYMBOLS MODIFIED BECAUSE OF PROXIMITY TO OTHER SYMBOLS		
RAILROADS - ROADS	 Crossties stopped at road casing	
RAILROADS - BRIDGES	 Crossties omitted on bridge and within .20" at wing ticks	
RAILROADS - RAILROAD SIDINGS	 Crossties stopped at parallel track	
BRIDGES - ROADS	 Line weight of bridge in addition to line weight of road casing	 Line weight of road casing included in line weight of bridge
BRIDGES - BRIDGES	 Center wing ticks omitted	 Center wing ticks included

Lesson 2

REVIEW EXERCISE

Check your understanding of the instructional material for Lesson 2 by completing these review questions. Try to complete all the questions without looking back at the lesson. When you have completed as many of the questions as you can, turn to the solutions and check your responses. If you do not understand a solution, go back and restudy the part in the lesson where the information is given. Solutions follow the review exercise.

The first two questions pertain to sharpening phonograph needles.

1. After properly inserting the needle into the chuck and placing the graver on the sharpening block, how do you sharpen the needle? It is done by-
 - A. Pulling the needle lightly over the sharpening stone several times
 - B. Moving the needle back and forth across the sharpening stone a few times
 - C. Applying a light pressure to the graver and pulling the needle across the sharpening stone
 - D. Moving the graver in a circular motion, allowing the weight of the graver to do the sharpening
2. If the line weight on the needle point becomes too wide while sharpening, what must be done?
 - A. The needle must be rounded and resharpened
 - B. The needle should be extended from the chuck to maintain the level of the graver
 - C. Another needle must be used because it is impractical to decrease the line weight
 - D. Replace the needle point with a sapphire or ruby-tipped point and sharpen it to factory specifications
3. What is the purpose of the following procedure? Seat the point and blade, synchronize the caster legs, check the horizontal level, and adjust and check the horizontal level.
 - A. To level the graver
 - B. To perform operational maintenance checks
 - C. To sharpen the blades
 - D. To alternate the level

Review Exercise Solutions

4. After you have scribed a test cut line, the scribecoat shows a jagged cut line in the plastic coating. What is the probable cause?
- A. Loose tension screw in the vertical cylinder head
 - B. Dirty or worn Teflon bushing
 - C. Allen tension screw is too tight in the cylinder head
 - D. Incorrect cutting angle on the point or blade
5. When the magnifier lens on the graver is used during the scribing process, which statement below best describes a correct line of sight?
- A. The lens is clean and properly adjusted over the scribed point, and a maximum field of view is obtained
 - B. The line of sight should be viewed straight through the center of the focal point in the magnifier lens and down to the scribing point
 - C. The lens enlarges the scribe image detail and steel blade tips while also allowing the maximum expansion of the magnifier focal point
 - D. The line of sight is perpendicular to the horizontal plane of the magnifier lens, achieving a wider field of view with exceptional clarity and depth

REVIEW EXERCISE SOLUTIONS

- 1. D, Moving the graver in a circular motion (page 23)
- 2. C, Another needle must be used because it is impractical to decrease the line weight (page 23)
- 3. A, To level the graver (page 25)
- 4. D, Incorrect cutting angle on the point or blade (page 34)
- 5. B, The line of sight should be viewed straight through the center of the focal point in the magnifier lens and down to the scribing point (page 36)

**LESSON 3
PREPARATION OF THE TYPE LIST
AND TYPE OVERLAY**

OBJECTIVE

Describe the basic principles of ordering type using DA Form 2594-R (Type List Order) and preparing a type overlay using stick-up type.

TASKS

051-257-1304, Prepare a type order.

051-257-1312, Produce interior type flats.

051-257-1313, Produce marginal data flats.

CONDITIONS

You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet, and a Number 2 pencil. Complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS

You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

CREDIT HOURS:

2

REFERENCES

TM 5-240, Compilation and Color Separation of Topographic Maps

TM 5-245, Offset Photolithography and Map Reproduction

STP 5-81C1-SM, Cartographer

STP 5-81C24-SM-TG, Cartographer

DMAHTC TM S-1, Specifications for Military Maps

Lesson 3/Learning Event 1

Learning Event 1: CHARACTERISTICS OF STICK-UP TYPE

The military uses the stick-up type method to apply letters and labels to type overlay materials. This method offers various advantages over freehand or mechanical lettering methods. Drafting letters by hand is eliminated, since stick-up type is produced by letter press or a photomechanical process from reproducible copies.

Quantities of type and preprinted symbols can be produced in advance and stored for future use. The thin Celanese clear film used in production reduces material cost, speeds up development and reproduction time, eliminates the need for special handling and storage, and makes cutting or separation of letters easier.

Flexibility is gained as stick-up type may be processed and used in a combined straight labeling unit or separated and individually fitted along a curve. Type and labels can be repositioned or removed from the type overlay as necessary, since it is held in place by a clear wax.

Learning Event 2: PROCEDURES FOR ORDERING TYPE

Normally the unit's cartographic section orders the type that will be needed in the preparation of the type overlay. It is the cartographer's responsibility to ensure all type ordered and received is acceptable in size, style, quantity, and condition. All type requirements for a give project will be hand-printed on a type list order form with proper size, style, and number of required copies specified in accordance with DMAHTC TM S-1.

Compilation Names Overlay

The geographic names and feature labels in the map interior are taken from the compilation names overlay. Marginal items are composed in accordance with the applicable style sheet, with information for the nonstandard items (those that vary from sheet to sheet) obtained from the compilation base, the grid computations, or the project instructions, as appropriate.

Ordering Type

When ordering type from a compilation names overlay, cover the overlay with a sheet of clear plastic or tracing paper on which each name may be crossed out as it is listed on the work sheet. This will help to ensure that all names are ordered, and that none are listed more than once. The original names overlay remains undamaged.

On a separate work sheet (Figure 32) extract the names and labels from the compilation names overlay and group them according to style and size. Use this worksheet as a guide in filling out the type list order form correctly.

FIGURE 32. SAMPLE WORK SHEET

Spartan Med	Spartan Mod It	CLFC IT
Barton Apple Orchard 8pt Caps	Chessy Railroad 4pt Caps	Placid Bay 8pt C&L
Black Forest 10pt Caps	River Road 4pt Caps	Potomac River 12pt Caps
Springfield Estates 10pt C&L	St. Marks Church 5pt C&L	Loss Creek 6pt C&L
Clarksburg 12pt Caps	General Hospital 5pt C&L	Piney River 8pt C&L

Lesson 3/Learning Event 2

Type Order List

The form used for ordering type is DA Form 2594-R (Type List Order. This illustrated form (Figure 33) can be reproduced locally on 8 1/2 x 11-inch sheets of paper. All items in the heading are self-explanatory, and should be carefully filled out.

The first column. In the first column the number of copies of a name or label is noted. It is best to order an extra copy of each name or label for backup. Also, order additional copies to allow for naming features more than once, as appropriate.

The second column. Enter the names or labels in the second column in capital letters, using the prepared work sheet. Those letters that will be capitalized on the finished product (according to DMAHTC TM S-1) will be underlined in red.

FIGURE 33. SAMPLE OF COMPLETED TYPE LIST ORDER

TYPE LIST ORDER		DATE RECEIVED		NO OF COPIES		PAGE NO		NO PAGES	
JOB NAME		PRODUCTION NO		PULL ON		AMOUNT OF TYPE		REDUCTION	
ORDER NO		SMIT CODE		PREPARED BY		DUE DATE			
CLARKSBURG		9875T		CELANESE CLEAR		NONE			
0001		5544		SP & DON JONES		28 AUG '85			
COPY		TYPE		COPY		TYPE			
		SIZE	STYLE			SIZE	STYLE		
2	CLARKSBURG	12 pt	SPARTAN MED						
2	BLACK FOREST	10pt	" "						
2	SPRINGFIELD								
	ESTATES	10pt	" "						
2	BARTON APPLE								
	ORCHARD	8pt	" "						
2	GENERAL HOSPITAL	5pt	SPARTAN MED IT						
2	ST MARK'S CHURCH	"	" " "						
3	CHESSEY RAILROAD	4 pt	" " "						
2	RIVER ROAD	"	" " "						
2	POTOMAC RIVER	12 pt	CLFC IT						
2	PLACED BAY	8pt	" "						
2	PINEY RIVER	"	" "						
3	LOSS CREEK	6pt	" "						
4	TPC POSICUT NO. 976								

DELIVER
Cartographic Section

DATE
6 Aug 85

CHECKED AND APPROVED BY
SSG BILL BEHRING

DA FORM 2694R Jul 82

Type Ordering Specifications

The proper grouping of entries on the form simplifies the work of the individual producing the type. All type of a given style should be grouped together, and type sizes within each style should also be grouped, with larger point sizes listed first.

Numerals of the same size and style of type may be listed together on one line, separated only by spaces. Grid numbers also may be listed together, with the different sized components of the numbers underlined with different colors, coded to the appropriate sizes listed in the size column.

Punctuation is never shown in conjunction with type in the map interior, except for hyphens and apostrophes that are part of the spelling of the name. Abbreviations should be avoided if possible. A few exceptions are permissible, such as St for Saint; these are shown without periods.

Most type facilities do not have fonts that include diacritics. When diacritics are necessary, they are usually added with ink to the type after it has been permanently affixed to the type overlay.

Indicate the specified type style in the last column of DA Form 2594-R. Approved abbreviations are shown in table 1 for type styles.

TABLE 1. ABBREVIATIONS FOR TYPE LIST

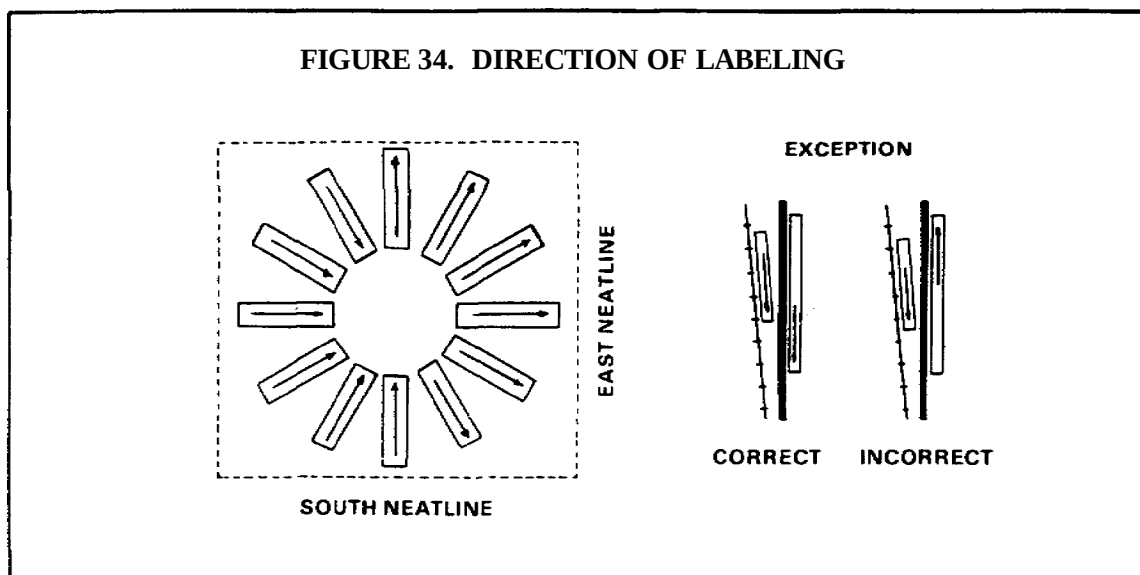
Name of Type	Type Abbreviation
News Gothic	News Goth
News Gothic Condensed	News Goth Cond
AMS Slope Gothic	AMS Slope Goth
Caslon Openface	Cas Opfc
Century Schoolbook	Cent Schbk
Clearface Italic	Clfc It
Copper Gothic Italic	Cop Goth It
Copper Gothic	Cop Goth
Heavy Copper Gothic	Hvy Cop Goth
Heavy Copper Gothic Condensed	Hvy Cop Goth Cond
Light Copper Gothic	Lt Cop Goth
Light Copper Gothic Condensed	Lt Cop Goth Cond
Spartan Medium	Spartan Med
Spartan Medium Italic	Spartan Med It

Lesson 3/Learning Event 3

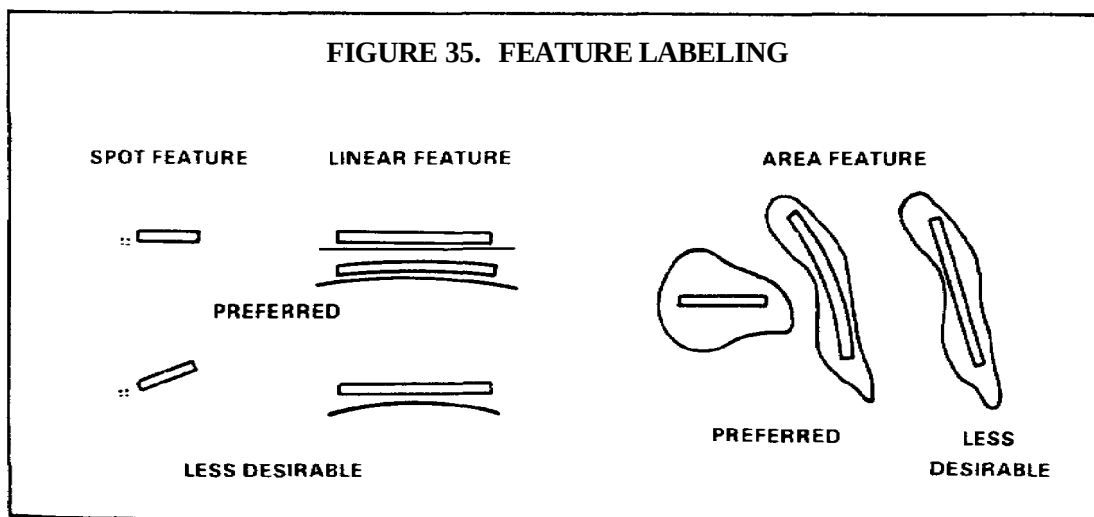
Learning Event 3: PRINCIPLES OF TYPE PLACEMENT

The principles governing type placement are established by the specifications published in the DMAHTC TM S-1.

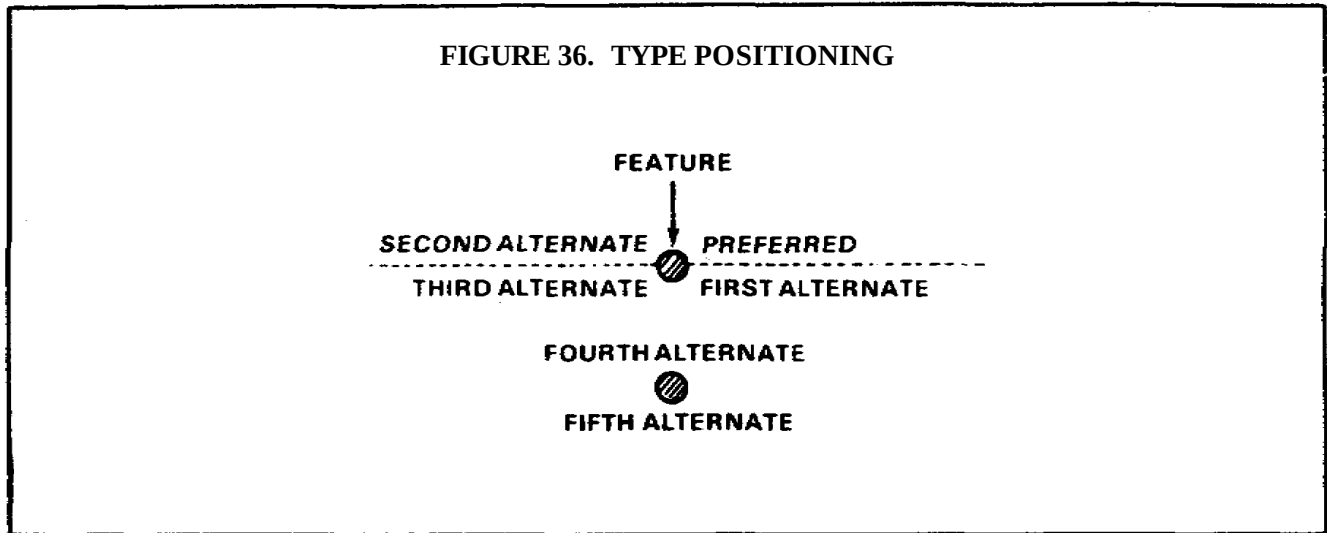
All type is placed to read from left to right when viewed from the south neatline or the map sheet's normal orientation. Figure 34 shows the direction of labeling and an exception to the guideline.



Interior type is positioned to assure immediate and unmistakable identification of the features being labeled. When possible, labeling is placed in areas of sparse symbolization to avoid obscuring important land formations and other detail. Labeling is placed either in a straight line or smooth curve depending on the character of the feature being identified (Figure 35).



When you label individual symbols or small concentrated groups of symbols making a single feature, the type is positioned adjacent to the feature or symbol defined. Figure 36 shows preferred and acceptable alternate positioning of type with exception of control points and spot elevations.



The overprinting of type (letter touching letter) regardless of printing color is prohibited. Where possible, avoid overprinting of type and detail that print in the same color. In unusual cases, particularly where smaller type sizes are involved, it is permissible to block out features when type legibility would otherwise be impaired.

It is emphasized that these guidelines are subject to exceptions. Frequently more than one rule may apply to type placement, and the rules may conflict with each other. The overriding factors in judging which set of rules takes precedence is determined from a standpoint of graphic legibility and order of feature importance.

Lesson 3/Learning Event 4

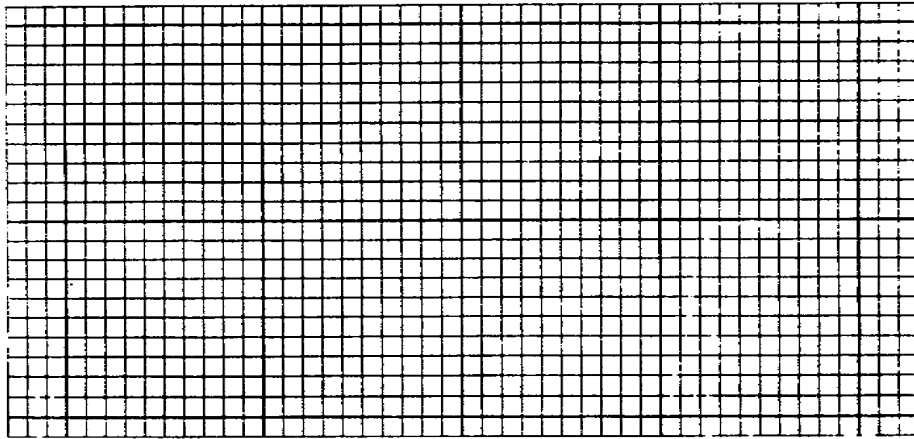
Learning Event 4: INSTRUMENTS AND MATERIALS FOR TYPE OVERLAY

Very few instruments and materials are required for the preparation of the type overlay.

Line Guide

A line guide (Figure 37) is an improvised lettering guide used to position and align straight line type and labels onto a piece of overlay material. The guide has a net of straight lines intersecting to form right angles, the same as a grid, except the overall distance between the first line to the opposite net line is no more than 0.1 inch. The guide's image is on a clean piece of acetate in a positive form.

FIGURE 37. LINE GUIDE



Burnishing Tool

The burnishing tool (Figure 38) is used to smooth type down onto the overlay material, while also simulating a squeegee by forcing air and excess wax out from between the type and the overlay material assuring a good bond.

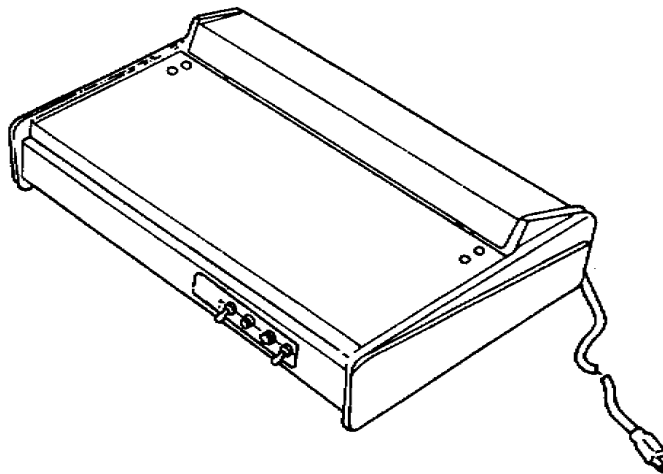
FIGURE 38. BURNISHING TOOL



Adhesive Wax Coater

An adhesive wax coater (Figure 39) is an automatic waxing machine used to apply a thin undercoating of warm wax over 100 percent of the type's emulsion. This simple method of applying wax onto type enables the cartographer to prepare and mount numerous pieces of type on an overlay in a very short time.

FIGURE 39. ADHESIVE WAX COATER



Beeswax

Beeswax is a soft pliable adhesive used to mount the type onto the overlay material. The nonpermanent bonding qualities of the wax allow the type to be removed or repositioned on the overlay material.

Cotton

Loose cotton is used to wipe excess wax off the overlay material after the type has been burnished. Cotton is also used to remove fingerprints and smudge spots and for general cleaning of the type overlay.

Lesson 3/Learning Event 5

Learning Event 5: CARE OF STICK-UP TYPE

Although stick-up type is a widely acceptable method for lettering, it does have some faults. The type overlays can be subjected to uncontrolled climatic temperature changes, which can cause the type to shift or peel off the overlay material. Rough handling and poor storage conditions can also scratch, soil, and crimp the overlay material, making it unusable. A few problems associated with stick-up type can be minimized or eliminated if certain precautions are taken before the type is placed on the overlay material.

New Type

It is best to always order and use new type for each assigned mapping project. Type that has been properly stored and meets the map specifications may be used.

Type Defects

When you receive new type, thoroughly examine each piece of type for defects. Specifically, you should look for such defects as listed below.

- Uneven tone or shades
- Light or faint type
- Disfigured or incomplete type
- Misspelled labels
- Overexposed type
- Scratched, soiled, or creased type
- Broken emulsion on type
- Correct quantities

Type Replacement

Destroy all defective type to prevent accidental use of it in the future. Immediately order type replacement for defective type and short type quantities, to expedite the reproduction process.

Inspect the Wax

Inspect the wax and look for a white translucent color that is firm to the touch but not hard or brittle. Wax should become soft and mold easily after being held in the closed palm of the hand for about three to four minutes. Should the wax fail to become soft after the allotted time, discard the old wax and replace with new.

Wax which has been handled many times absorbs the dirt and body oils from the hands, causing the wax to become a yellow or dingy color. Discard the old, discolored wax and replace it.

The wax should be wrapped in its original paper wrap and stored in a cool place after each use. Do not allow wax to come in contact with dirt or other foreign material which can become embedded in the wax.

Learning Event 6: PREPARING OVERLAY FOR TYPE

After all instruments and materials have been checked and found to be in good condition, the overlay material is prepared to receive the stick-up type. A separate type overlay is prepared for each color of type appearing on the map sheet. The number of type overlays required is in accordance with the project instructions and specifications. Determine the number of type overlays before filling out the type order list.

Placing the Map Base

Place the map base (positive) on the light table and tape it in place. To illuminate the map base, turn the light table switch to the ON position.

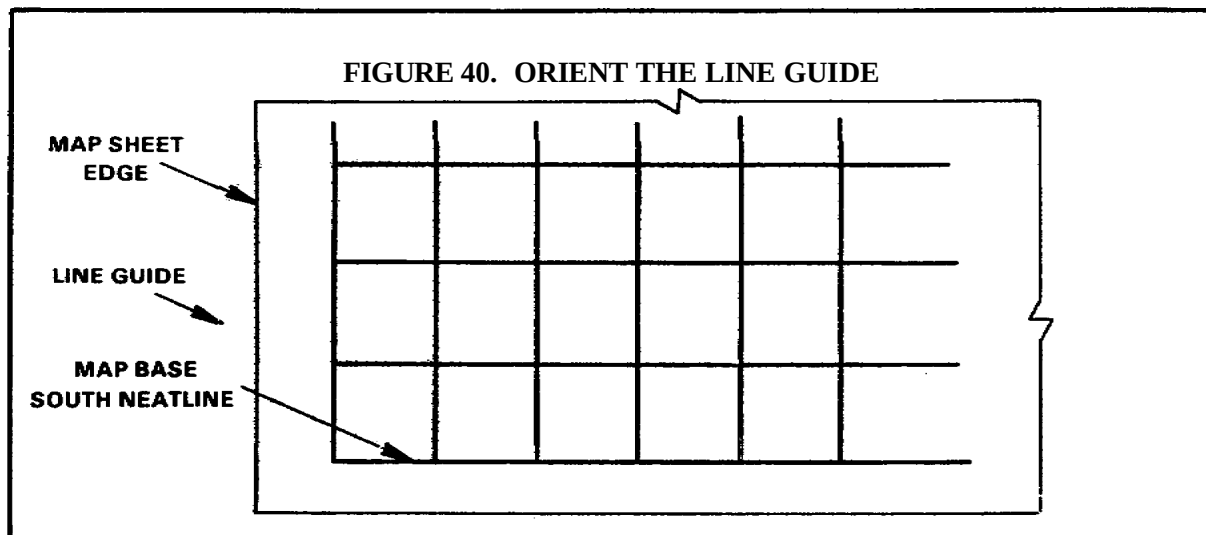
Placing the Line Guide

Orient the line guide on top of the map base, registered to the south neatline (Figure 40), and tape it in place as follows.

The dimensions of the line guide sheet should be equal to the map base.

One horizontal line from the line guide will be registered to the south neatline of the map base, with all other horizontal lines being parallel to the south neatline.

All vertical lines of the line guide will be perpendicular to the south neatline of the map base.



Placing the Overlay Material

Place a sheet of stable base overlay material on top of the line guide and register the overlay material to the map base.

Weights or tape may be used to hold the overlay material on the line guide sheet

A registration bar or pins are used to retain the registration of the overlay material with the map base.

Lesson 3/Learning Event 7

Learning Event 7: POSITIONING TYPE

Determine type position on the overlay material in accordance with DMAHTC TM S-1 and the project instructions as appropriate. There are some important factors in positioning the type correctly.

- No important features should be overprinted
- Type should be completely legible
- Type should be attractively arranged
- The type overlay should be clear, easily read, and neat.

Learning Event 8: APPLYING TYPE

Cutting the Type

After examining the type carefully, cut only the pieces of type you will need at one given time. Use the following procedure.

Score the emulsion around the type with a craft knife and peel it away from the acetate base, using the edge of the blade.

Ensure the type emulsion has a clean separation from the acetate base to prevent damaging type.

Applying Wax

Apply wax to the type or type overlay material using the following procedure.

If a waxing machine is used, ensure the waxed type pieces are clear of all foreign matter.

If wax is applied manually, place a small amount of wax directly on the type overlay area.

Placing the Type

Place the type, right reading, on the overlay material using the following procedure.

Position the type according to specifications of DMAHTC TM S-1 and the project instructions.

Align the type with the aid of the line guide sheet.

Securing Type in Place

Cover type with a scrap piece of acetate or paper and burnish the type pieces onto the overlay material. Always work from the center to the edge when burnishing.

Burnish the type until all excess wax and air are forced from under the type piece. Be careful not to remove too much wax.

If working surface on type overlay material becomes too warm from table light heat, turn off the lights on the light table and allow the wax and overlay material to cool.

Carefully peel the piece of scrap acetate away from the overlay material, leaving the type pieces in position.

Cleaning Type Area

Lightly brush across the type with a piece of loose cotton removing all excess wax around the type and off the overlay material.

NOTE: Use care to avoid moving or damaging the type.

Lesson 3/Learning Event 8

Checking Type Overlays

Perform a quality control check on each type overlay using the following procedures.

Register all completed type overlays together and ensure all type is correctly positioned. Be sure type does not overlap the type placed on the other overlays.

Register each type overlay to its own map base and ensure each type piece is correctly positioned. Be sure type does not overprint significant details.

Composite all completed type overlays to a color proof. Ensure all type is correctly positioned. Be sure type does not overlay other type or overprint significant details.

Protecting Type Overlays

Make all necessary adjustments, and cover each type overlay with a protective cover sheet. Place a paper covering over the type overlay, and tape in place. Do not fold, bend, or handle the type overlay carelessly. Transmit the type overlay to the reproduction section.

Lesson 3

REVIEW EXERCISE

Check your understanding of the instructional materials in Lesson 3 by completing the review exercise without looking back at the lesson. When you have completed as many of the questions as you can, turn to the solutions for the lesson and check your responses. If you do not understand a solution, go back and restudy the part in the lesson where the information is given. Solutions follow the review exercise.

1. Celanese clear acetate film is the material on which the _____ is produced.
2. It is the cartographer's responsibility to ensure all type is acceptable in _____, _____, quantity, and condition.
3. When you are ordering type, all geographic names and features in the map interior are taken from-
 - A. The names and label extraction
 - B. The compilation names overlay
 - C. The map base
 - D. The map compilation
4. DA Form 2594-R is used for _____ type.
5. Which instruments or materials are used to prepare the type overlay?
 - A. Burnishing tool and line guide
 - B. Peelcoat and rigid scribe
 - C. Optical microscope and lens tissue
6. Cotton is used for _____ of the type overlay.
7. What is the first step in ordering type?
 - A. Extract marginal items from the compilation overlay, and place on a separate work sheet
 - B. Determine the number of type overlays to be prepared
 - C. Cover compilation with a cover sheet, and mark off the type pieces after ordering each
 - D. Extract names and feature labels from the map interior
8. The south neatline of the map base is used to _____ the horizontal lines on the line guide.
9. What is used to hold the overlay material onto the line guide sheet?
 - A. Thumb tacks or wax
 - B. Paper clips or pins
 - C. Weights or tape

REVIEW EXERCISE SOLUTIONS

1. Type (page 46)
2. Size, style (page 47)
3. B, The compilation names overlay (page 47)
4. Ordering (page 48)
5. A, Burnishing tool and line guide (page 52)
6. General cleaning (page 53)
7. B, Determine the number of type overlays to be prepared (page 55)
8. Register (page 55)
9. C, Weights or tape (page 55)

LESSON 4 PROCEDURES FOR COLOR SEPARATION

OBJECTIVE

When you complete this lesson, you will be able to describe the basic procedures of the color separation process using the various methods of color separation. Also, you will be able to identify the methods of color separation and the five phases of the color separation process.

TASKS

051-257-1307, Scribe cultural features
051-257-1308, Scribe miscellaneous cultural features
051-257-1309, Scribe hydrographic features
051-257-1310, Scribe hypsographic features
051-257-1311, Produce window flats
051-257-2025, Edit color separation projects

CONDITIONS

You will be given subcourse booklet EN5307, an ACCP Examination Response Sheet and a Number 2 pencil. Complete the subcourse at your own pace in your own environment with no supervision.

STANDARDS

You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

CREDIT HOURS

2

REFERENCES

TM 5-240, Compilation and Color Separation of Topographic Maps
TM 5-245, Offset Photolithography and Map Reproduction
STP 5-81C1-SM, Cartographer
STP 581C24-SM-TG, Cartographer
DMAHTC TM S-1, Specifications for Military Maps

Lesson 4/Learning Event 1

Learning Event 1: COLOR SEPARATION METHODS

The separation of colors for lithographic printing can be accomplished by using several methods. Each method has its own advantages and disadvantages. The given situation, time requirements, and many other production variables are factors considered in determining the most suitable method to be used in the color-separation process.

Film and Filter Method

Colors are separated entirely by a photomechanical process in this method. When you combine the proper colored filter with a film of the desired sensitivity, it is possible to screen out an unwanted color during photographic reproduction, while retaining the others. Although this method has certain cartographic applications, it is not widely used by military units because of the these disadvantages.

This process requires highly skilled and experienced camera personnel with access to a variety of films and filters.

Ink pigments used to prepare the original are seldom pure tones of one color and are difficult to drop completely with the standard film-filter combinations.

Most map copy needs some revisions, so that a photomechanical separation of colors is seldom practical.

Opaque Method

To color separate by opaquing, it is necessary to process as many negative images of the original as there are colors to be printed. On each negative, all detail except that to print in the desired color is painted with opaquing fluid. A separate negative is prepared for each color, to be used to process the press plates for lithographic printing. As with the masking method, this technique is used only when the various colors do not overlap each other.

Pen-and-Ink Drafting Method

In this method, the compilation manuscript is photomechanically reproduced in positive form in a nonphotographic blue color on metal-mounted drafting paper. One blue line image is prepared for each color of the final map. The desired detail of each color is traced using India ink with specified symbols. All type and prepared symbol cuts and patterns are applied directly to the appropriate inked drawing. With this method, both the compilation manuscript and the blue line images are prepared one-fifth larger than the final reproduction. The necessary reduction, by copy camera, for the platemaking stage helps to minimize the flaws and irregularities of the inked lines. Because skilled cartographers are required for pen-and-ink drafting, and more time is needed to complete a drawing, this method has been replaced by plastic scribing in military topographic units, although it is occasionally used for other types of lithographic printing.

Scribing Method

See Lesson 2 for a detailed description of this method.

Masking Method

This method is also a photographic operation but requires that the different colors which make up the copy do not overprint each other, but occur in clearly separate areas. The camera operator simply masks out all but the single desired color for a plate and then exposes the negative. For the next negative, the operator changes the mask to permit only that detail to print in a second color to be recorded on the film. This process is repeated to produce as many negatives as there are colors. Because most map detail is both intricate and overlapping, masking is seldom used to color separate cartographic copy, except for an occasional overlay of area features which are separated from each other in such a way that they can be successfully masked.

Lesson 4/Learning Event 2

Learning Event 2: COLOR SEPARATION PROCEDURES

The color separation procedures (Figure 41) for a standard topographic military map (four colors: black, blue, red-brown, and green) can be made in five major production phases. Various cartographic and reproduction performance measures usually interface during each stage of the major production phases.

Phase I: Operations and Planning

This phase is designed to evaluate, determine, project support needs, and to execute support request for Phase I.

Evaluate the following areas for-

- Adequate project instructions
- Adequate project source materials
- Production limitations
- Production capacity
- Project support

Determine the need for-

- Project requirements
- Use of source materials
- Methods and procedures of color separation
- Map layout of marginal data and image guide
- Production material needs, such as number of scribe coats, overlays, peel coats, and all necessary supplies

Project support needs for-

- Type support
- Guide image support
- Material composite support
- Color proof support
- Reproduction material support
- Execute support request for Phase I

Coordinate with the reproduction section for punch hole registration and corner tick registrations of all color separation materials produced.

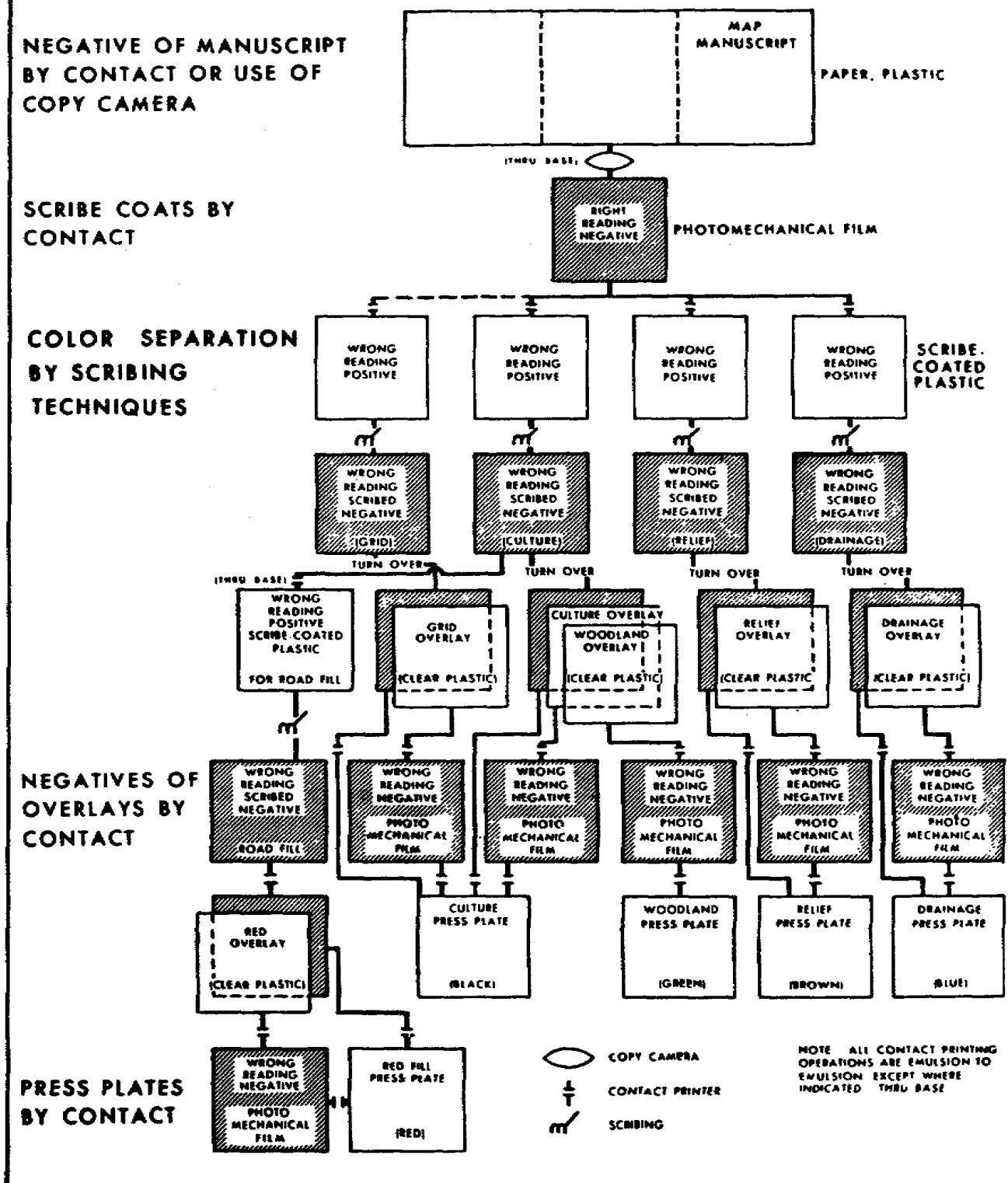
Coordinate for-

- A map manuscript
- A master film negative
- Scribe coats
- Peel coats
- Overlay materials
- Composites
- Color proofs

Submit support documentation for a-

- Type list order
- Work order (type support request)
- Reproduction jacket request and transmittal

FIGURE 41. TYPICAL COLOR SEPARATION PROCEDURE



Lesson 4/Learning Event 2

Request that an image guide be applied to such scribecoats as shown below.

- Grid (prints black)
- Culture (prints black)
- Drainage (prints blue)
- Relief (prints red-brown)
- Road fill (prints red-brown)

NOTE: If extensive color separation is required, forward the map compilation manuscript to the reproduction section to have an image guide contact printed (burned) onto the required number of scribecoats. During a minor color-separation operation, the scribecoats are registered to the map compilation manuscript to provide a guide for scribing.

Phase II: Color Separation of the Image Guide (Scribing Method)

Prepare a scribed negative for each color required for the final product. The following negatives are scribed for typical large-scale color-separation projects, but the procedures and applications apply to most minor revision projects.

NOTE: Register all scribed negatives to the neckline prior to scribing corner ticks and interior features. This method of registration, in conjunction with corner tick registration, is an accurate and expedient practice used when working with two or more negatives. It also serves as an edit check for proper registration.

Grid negative. Scribe grid lines and declination diagram prongs on this flat. A master grid is scribed and used for projects with more than one map sheet. The projection corner ticks are plotted on the master grid from DA Form 1941 (Grid and Declination Computations). The interior projection ticks are plotted from DA Form 1932 (UTM Grid Coordinates from Geographic Coordinates).

Culture negative. Scribe neckline, projection ticks, and all cultural features on this flat, and tab register. The neckline and projection ticks are scribed from the projection ticks located on the master grid. The neckline is then used to register and scribe corner ticks on all remaining flats.

Request that the reproduction section apply culture image guide on a sheet of scribecoat or peelcoat.

Forward culture negative, work order request and transmittal to the reproduction section.

NOTE: Standard legends are designed for use on a map series or on maps covering a country or a region. On standard or nonstandard products, symbols of linear features (such as road fill, relief symbols, and drainage features) are shown in the legend in their appropriate color. These symbols are either scribed on the appropriate negative or prepared on a type overlay (clear film) in POSICUT form. In any case, the negative or overlay must be registered to the marginal information flat, and the symbol scribed or stuck-up in the proper location in the legend.

Drainage negative. Scribe all drainage single line work.

Relief negative. Scribe all contours and other relief symbols that represent elevation.

Perform quality control checks (preliminary) color-separation edit to determine-

- The quality of scribing
- The proper symbolization
- The completeness
- Any additional quality control checks

Make corrections for color-separation edit.

Edit the corrections.

Request image guide on cultural negatives be applied to such peelcoats, as shown below.

- Road-fill (red-brown)
- Built-up area tint (red-brown) such as international boundaries and military reservation boundaries
- Open-water tint (screened blue) such as double-line streams, and navigable waters
- Vegetation tint (screened green)
- Special open windows (according to project instructions and DMAHTC TM S-1)

Transmittal. Transmit work order request and scribed negatives to the reproduction section.

Phase III: Preparation of Overlay Materials

An open-window negative is a special adaptive negative that has defined open areas (void of any image detail). These open areas are prepared in the negative emulsion (or coating) in which a tint or image symbol pattern is to be placed and composited onto another negative. Open-window negatives are prepared by one of two methods: opaquing or peelcoat. The opaque method is done on stable base material positives by opaquing out the area features that require screening. When the peelcoat method is used, the coated area outlines that require screening are cut with a knife and peeled away.

NOTE: Register all peelcoat positives to the appropriate base manuscript by crossmarks (butterflies). Register all base material positives by POSICUT corner ticks.

Preparing open-window negatives. Prepare open-window negatives by cutting the peelcoat plastic coating along the appropriate outline areas that represent the area feature or symbol pattern. Peel the plastic coating off with a knife, leaving a clear area (open window) in the sheet of peelcoat. When cutting the plastic coating on peelcoats, apply a light pressure with the knife to avoid cutting into the plastic base material.

NOTE: Base material positives are produced into open-window negatives by opaquing or inking out the desired areas representing one area feature or symbol pattern. The open-window positives are made into negatives by the reproduction section.

Lesson 4/Learning Event 2

Preparing negatives for screens, colors, and symbols. Prepare a separate open-window negative or positive for all areas requiring a different screen, color, and symbol pattern.

Registration of negatives. Register together all open-window negatives to ensure that open areas do not overlap. Make necessary corrections using opaquing fluid and brush. Perform quality control checks (preliminary) color separation edit-scribe on-

- The quality of opaquing and inking
- The sheet registration
- The open areas registration
- The completeness of the job
- Any additional quality control checks as necessary

Make corrections for color-separation edit

Edit the corrections.

Preparation of overlay materials. (Refer to Lesson 3, page 45.)

NOTE: A separate overlay is prepared for each color of type appearing on the map sheet.

Perform quality control checks (preliminary) color-separation edit-overlay on-

- The sheet registration
- The type layout and accuracy
- The type size and style
- The quality of the type
- The spelling
- Any additional quality control checks as necessary

Make corrections of color-separation edit, and edit review of corrections.

Request negatives. Request all overlays be made into negative films by the reproduction section.

Transmittal. Transmit work order request and overlays to the reproduction section.

Phase IV: Performance of Quality Control

At the completion of each major production phase, a thorough review of all color-separation materials is made. The reviews, referred to as edits, ensure map detail accuracy, consistency of treatment, adherence to specifications, quality of product appearance, and completeness of the production phase.

Types of edits. Perform edits after completing each stage of the major production phase.

Compilation edit. This edit consists of a comprehensive review of the compilation manuscript and all accompanying overlays. The review is made from several standpoints, each of which affects the quality of the finished map.

Check the accuracy of the positioning of all compiled detail, with respect to the control, grid, and projection; review the use made of the available source materials; verify adherence to specifications and any other established policy guidelines; and evaluate the appropriateness of the selection and density of detail.

Preliminary color-separation edit. This edit is a direct examination of the accuracy and quality of each color-separated scribecoat, peelcoat, or overlay, for fidelity to the guide image, proper symbolization, completeness, quality of scribing, spelling of names, and similar items.

Final color-separation edit. This edit is made on a full-color composite proof. It is most useful for checking registration and type overprints, as well as the reproduction quality of the line work and other detail, because it represents the first time all of the color-separated materials have been combined on one copy in appropriate colors.

NOTE: Before the press plates are made for the final reproduction of a map, the color-separated negatives are carefully edited to ensure that all detail is complete and correctly symbolized, and that there are no overprints or misregistration of colors. The edit is usually made on a composite color proof prepared by the reproduction unit. Each of the negatives is exposed, in sequence, onto a sheet of white plastic sensitized for each exposure with the appropriate color coating.

Review of corrections. After all corrections have been incorporated, the color-separated materials are examined again to ensure that all edit corrections have been made and that necessary blockouts for type have been accomplished. The editor may require a second composite proof of the corrected material if the corrections were excessive in number or serious in nature. When this review indicates that the color-separated materials are satisfactory, they are ready for reproduction.

When all corrections are made on the final color proof, a DA Form 3727-R (Reproduction Jacket Request and Transmittal) will be prepared prior to sending the job to reproduction.

The feature and color used in printing the negatives and overlays will be indicated on the transmittal.

Phase V: Preparation of Reproduction Materials

Press plates are made from the negatives and overlays by the reproduction section.

Layout. The term layout means the exact positioning of the negatives and overlays, within specified dimensions, on masking paper. When negatives and overlays are positioned on masking paper they are called flats. A flat is made from all the negatives and overlays, using the following process.

- The black flats are prepared first
- The red-brown flats are prepared second, using the black as a basis for registration
- The blue flats are prepared third, using the black as a basis for registration
- The green flats are prepared last, again using the black as a basis for registration

Lesson 4/Learning Event 2

Plates. Press plates are prepared from the flats. All the flats of one color are combined during the plate-making phase to make a single plate per color. It is essential, therefore, that all the flats be perfectly registered, not only within a single color, but also to all other flats making up the other plates.

Press. The press plates produced from the flats made in layout are on the press for production. The following is the order, by color, in which the plates are mounted and printed.

- Black
- Red-brown
- Blue
- Green

Lesson 4
REVIEW EXERCISE

Check your understanding of the instructional materials for Lesson 4 by completing the review exercise without looking back at the lesson. When you have completed as many of the questions as you can, turn to the solutions and check your responses. If you do not understand a solution, go back and restudy the part in the lesson where the information is given. The solutions follow the review exercise.

1. Which two methods are used to produce an open-window negative?
 - A. Peelcoat or scribing
 - B. Masking or pen-and-ink drafting
 - C. Opaque or peelcoat
2. When is a quality control check performed during production?
 - A. After the color-separation process
 - B. At the completion of each major production phase
 - C. Before the next color-separation procedure
3. Which color-separation negative is used to register and scribe corner ticks on all remaining image guides to be scribed?
 - A. Relief negative
 - B. Drainage negative
 - C. Culture negative
4. The red road-fill image guide is a reproduction copy of the-
 - A. Special symbol feature overlay
 - B. Built-up area overlay
 - C. Culture negative
 - D. Boundary overlay
5. What phase do you forward the type list order and the reproduction work order to the reproduction section?
 - A. Phase I, Operations and Planning
 - B. Phase II, Color Separation of the Image Guide (Scribing Method)
 - C. Phase III, Preparation of Overlay Materials
 - D. Phase V, Preparation of Reproduction Material

REVIEW EXERCISE SOLUTIONS

1. C, Opaque or peelcoat (page 67)
2. B, At the completion of each major production phase (page 68)
3. C, Culture negative (page 66)
4. C, Culture negative (page 67)
5. A, Phase I, Operations and Planning (page 64)

Lesson 5

LESSON 5 SPECIFICATIONS FOR COLOR SEPARATION

OBJECTIVE

Identify the correct chapter, section, or appendix in the Defense Mapping Agency Technical Manual, Specification 1, DMAHTC TM S-1, which pertains to the color-separated material being prepared.

CONDITIONS

You will be given information on how to use and locate information in the DMAHTC TM S-1, subcourse booklet EN5307, an ACCP Examination Response Sheet and a Number 2 pencil. Work at your own pace in your own environment with no supervision.

STANDARDS

You must be able to complete the review exercise and respond correctly to 75 percent of the examination questions.

CREDIT HOURS

1

REFERENCES

STP 581C1-SM, Cartographer
STP 581C24-SM-TG, Cartographer
DMAHTC TM S-1, Specifications for Military Maps

Learning Event 1:

PURPOSE

The Defense Mapping Agency Hydrographic/Topographic Center, Technical Manual, Specifications 1 (DMAHTC, TM S-1) provides the basic specifications for military and special purpose maps prepared by Defense Mapping Agency Hydrographic/Topographic Center (DMAHTC) and other Corps of Engineer topographic units. The TM S-1 describes the basic requirements for design and content of worldwide mapping at all standard military scales.

NOTE: Special treatment for unique conditions or features not covered in the TM S-1 or deviations from the specifications stated in the TM S1 will be contained in supplemental project instructions.

Lesson 5/Learning Event 2

Learning Event 2: FORMAT

The contents of the TM S-1 is divided into chapters (with supportive appendixes) and sections (with supportive annexes).

When preparing the grid and projection, find the line weight and type specifications in Appendix 1, the DMA 2550-100 Style Sheet.

The style sheet provides you with the required line weights for scribing, type sizes, and positioning for labeling the grid and projection. The sheet also gives you the required specifications and/or POSICUT number for the declination diagram.

**Learning Event 3:
MAP INTERIOR**

When preparing the color-separated material for the interior map features, reference is made to Chapter 6, Compilation and Symbolization. Chapter 6 is divided into 10 sections.

Section I, General

This section covers the scope and general principles pertaining to compilation and symbolization.

Section II, Roads, Railroads, and Related Data

This section provides a basic description and specifications for the symbolization of roads, railroads, and related features on standard large-scale topographic maps.

Section III, Buildings and Populated Places

This section provides a basic description and specifications for the symbolization of buildings and populated places for standard large-scale topographic maps.

Section IV, Miscellaneous Cultural Features

This section provides a basic description and specifications for the symbolization of miscellaneous cultural features for standard large-scale topographic maps. The term cultural features refers to those features in the terrain which are the results of the workings of people. Exceptions are those cultural features discussed in Sections II, Roads, Railroads, and Related Data, and Section III, Buildings and Populated Places.

Section V, Relief

This section provides a basic description and specifications for symbolization of relief feature. for standard large-scale topographic maps.

Section VI, Drainage (Inland Hydrography)

This section provides a basic description and specifications for the symbolization of drainage features.

Section VII, Vegetation

This section provide the basic specifications for the features.

Section VIII, Coastal Hydrography

This section provides the basic specifications for symbolization of coastal hydrographic features.

Lesson 5/Learning Event 3

Section IX, Names

This section provides the basic guidance for the treatment of names, descriptive information, and expressions of political status on maps at the standard scales of military mapping.

Section X, Typography

This section provides the basic specifications for the placement and selection of all interior type. It also provides information concerning type style and size for preparing a type order list.

Learning Event 4: SECTION FORMAT FOR CHAPTER 6

Sections II through VIII

Each section is divided into two parts as described below.

First part. The first part is printed information describing the features with a symbol number pertaining to the feature in the right margin (Figure 42).

FIGURE 42. PRINTED INFORMATION

14. Mining Features

b. Where a number of mines cover a general area, individual mine symbols are not shown; the area is outlined and labeled. 456

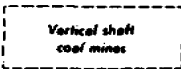
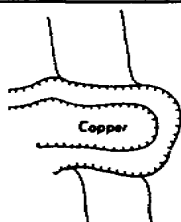
NUMBER

MATERIAL GUIDANCE

(3) *Open-pit mines* and quarries are worked from the surface and are represented by the escarpment symbol. 461

Second part. The second part of each section is a listing of the features covered in the first part. The listing (Figure 43) names the features, illustrates the symbol with descriptive label (if appropriate), gives specification remarks for scribing, and states the symbol number. The symbol number is the same number that appears at the right side of the printed material in Figure 42.

FIGURE 43. ILLUSTRATION OF SYMBOLS

FEATURE	SYMBOL	SYMB. NO.
Mining area	 Vertical shaft coal mines Line weight 004" : 1 mm; Dash 032" : 8 mm; Space 010" : 4 mm;	456
Open-pit mine	 Tics Line weight 006" : 15 mm Length 016" : 4 mm Space 016" : 4 mm	461

Lesson 5/Learning Event 4

Section IX, Format

Section IX is a printed description only. There are no illustrations.

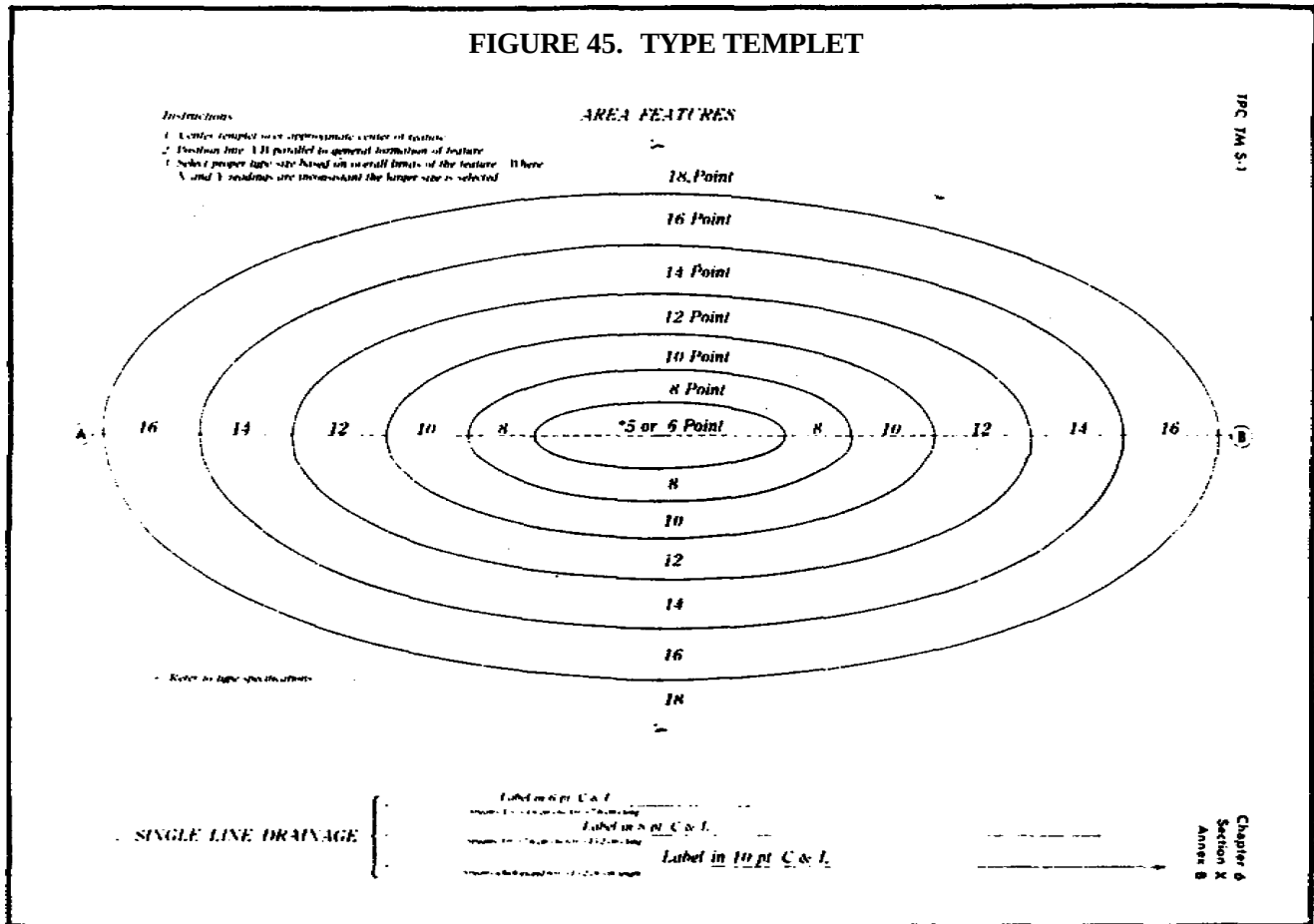
Section X, Format

Section X is divided into two parts. The first part consists of printed material and illustrations describing correct type placement and positioning. The second part consists of three annexes.

Annex A, Type Specifications. A listing of typography giving the feature, an example of the type, the type specifications, and the type code (Figure 44).

FIGURE 44. SAMPLE PORTION OF ANNEX A			
TYPOGRAPHY			
FEATURE	EXAMPLE	TYPE SPECIFICATIONS	TYPE CODE
Area names	BRUSNICA <i>Letter space or extend where necessary</i>	6-18 Pt. Spartan Light Caps <i>Use type templet when making selections</i>	606J
Enclosures	<i>Rifle range</i> <i>Reservoir</i> <i>Mining area</i>	5-10 Pt. Spartan Medium Italic <i>Use type templet when making selections</i>	605K
Single line drainage	<i>Little Pee Dee</i>	6-10 Pt. Clearface Italic C & I. <i>Use type templet when making selections</i>	289K

Annex B, Type Templet. This is used to determine the type size required for area features and single line drainage (Figure 45). In Figure 44 for example, you will notice that for the feature's "Area names" and "Enclosures," a range of type size is given under the type specifications. The area features type templet (Figure 45) is centered over the approximate center of the feature to determine which type size, within the allowable range, should be used. For the feature "Single line drainage," a range of type size is also given under type specifications. To determine the correct type size, place the single line drainage type templet over the drainage feature and measure its length.



Annex C, Type Specimens. Type specimens are shown in Figure 46, page 80.

Usage. Chapter 6 should be used when preparing the color separated materials for the features appearing in the map interior such as cultural features, relief, hydrography, vegetation, and the interior type.

FIGURE 46. ANNEX C-TYPE SPECIMENS

CLEARFACE ITALIC (289K)

5 PT. ABCDEFGHIJKLMNOPQabcdefghijklmnopqrstuvwxyz1234567890ABCDEFGHI
6 PT. ABCDEFGHIJKLMNOPQRSTabcdefghijklmnopqrstuvwxyz1234567890
8 PT. ABCDEFGHIJKLMNabcdefghijklmnopqrstuvwxyz1234567890
10 PT. ABCDEFGHIJKLabcdefghijklmn1234567890
12 PT. ABCDEFGHIJabcdehijkl1234567890
14 PT. ABCDEFGHIabcdehijkl1234567890
16 PT. ABCDEFGabcdehijkl1234567890
18 PT. ABCDEFabcdehijkl1234567890

NEWS GOTHIC COND. (204J)

4 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890ABCDEFGHIJKLMN
5 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890ABCDEFGHI
6 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
8 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
10 PT. ABCDEFGHIJKLMNOPabcdefghijklmnopqrstuvwxyz1234567890
12 PT. ABCDEFGHIJKLabcdehijkl1234567890
14 PT. ABCDEFGHIJKabcdehijkl1234567890
16 PT. ABCDEFGHabcdehijkl1234567890
18 PT. ABCDEabcde1234567890

SPARTAN MEDIUM (605J)

4 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890ABCDEFGHI
5 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
6 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
8 PT. ABCDEFGHIJKLMNOPabcdefghijklmnopqrstuvwxyz1234567890ABC
10 PT. ABCDEFGHIJKLMNabcdefghijklmnopqrstuvwxyz1234567890
12 PT. ABCDEFGHIJKLabcdehijkl1234567890
14 PT. ABCDEFGHIJKabcdehijkl1234567890
16 PT. ABCDEFGHIabcdehijkl1234567890
18 PT. ABCDEFabcdehijkl1234567890

SPARTAN LIGHT (606J)

4 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890ABCDEFGHI
5 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
6 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
8 PT. ABCDEFGHIJKLMNOPabcdefghijklmnopqrstuvwxyz1234567890
10 PT. ABCDEFGHIJKLMNabcdefghijklmnopqrstuvwxyz1234567890
12 PT. ABCDEFGHIJKLabcdehijkl1234567890
14 PT. ABCDEFGHIJKabcdehijkl1234567890
16 PT. ABCDEFGHIabcdehijkl1234567890
18 PT. ABCDEFGHabcdehijkl1234567890

SPARTAN MEDIUM ITALIC (605K)

4 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890ABCDEFGHI
5 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
6 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
8 PT. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890
10 PT. ABCDEFGHIJKLMNabcdefghijklmnopqrstuvwxyz1234567890
12 PT. ABCDEFGHIJKLabcdehijkl1234567890
14 PT. ABCDEFGHIJKabcdehijkl1234567890
16 PT. ABCDEFGHIJabcdehijkl1234567890
18 PT. ABCDEFGHIabcdehijkl1234567890

**Learning Event 5:
MARGINAL INFORMATION**

When preparing the marginal data flats, refer to Chapter 7, Marginal Information, and the style sheet in Appendix I. Chapter 7 is divided into three sections.

Section I, General

This covers the scope and policy and lists map identifications and other marginal data. It also references the style sheet for use in design and location of marginal items.

Section II, Map Identifications

This covers the use of map identifications and explains their purpose. The following list of marginal item is classified as map identifications.

- Map series
- Series name and scale
- Series number
- Edition number
- Sheet name
- Sheet number
- Stock number

Section III, Other map information

This covers all the remaining marginal information not classified as map identifications. It defines each item, explains its purpose, illustrates examples, and states exceptions. Section III also covers language requirements and alternate positioning of data. The following is a list of those marginal items appearing on the map, which are not considered map identifications.

- Symbol legend
- Glossary
- DMA Seal
- Scale note and bar scale
- Contour interval note
- Spheroid note
- Projection, grid, and declination date
- Datum notes
- Credit note
- Credit listings
- Elevation guide
- Adjoining sheets diagram
- Boundary diagram
- Disclaimer notes
- Security classification note
- User's note
- Currency notes
- Special notes

Lesson 5/Learning Event 5

In addition, Section III also covers language requirements and alternate positioning of data.

Style Sheet

The style sheets found in Appendix I illustrate the design of marginal items and their location on the map. The style sheet illustrates two separate arrangements in view of the variations that occur in marginal information from sheet to sheet and project to project. The appropriate arrangement is determined according to project instructions, DMAHTC TM S-1 Chapter 7, and TM 5-241-1 requirements. Always use the style sheet with Chapter 7 of DMAHTC TM S-1 when preparing the color separated materials for the marginal information.

Lesson 5
REVIEW EXERCISE

Check your understanding of the instructional material in Lesson 5 by completing the review exercise without looking back at the lesson. When you have completed as many of the questions as you can, turn to the solutions and check your answers. If you do not understand a solution, go back and restudy the part in the lesson where the information is given. Solutions follow the review exercise.

1. Special treatment for unique conditions, features not covered in the TM S-1, or deviations from the specifications stated in the TM S-1 will be contained in _____.
2. How are the contents of the TM S-1 grouped?
 - A. Chapters and glossaries
 - B. Annexes and appendixes
 - C. Chapters and sections
 - D. Chapters and annexes
3. Chapter 6 of the TM S-1 covers what information?
 - A. Interior map features
 - B. Marginal information
 - C. Grid and projection
 - D. Style sheet
4. Where is the symbol number located in relation to the printed information describing a feature?
 - A. Left margin
 - B. Below it
 - C. Above it
 - D. Right margin
5. Which section of Chapter 6 covers the placement and positioning of interior type?
 - A. Section III
 - B. Section IV
 - C. Section IX
 - D. Section X
6. What does Chapter 7 in the TM S-1 cover?
 - A. Interior map features
 - B. Marginal information
 - C. Grid and projection
 - D. Style sheet

REVIEW EXERCISE SOLUTIONS

1. Supplemental project instructions (page 73)
2. C, Chapters and sections (page 74)
3. A, Interior map features (page 75)
4. D, Right margin (page 81)
5. D, Section X (page 76)
6. B, Marginal information (page 81)